DOCUMENT RESUME

ED 198 286 CE 027 930

AUTHOR DiPaul, H. Bert
TITLE Focusing Industrial Arts on Career Education. A Handbook for Industrial Arts Teachers and Students.
PUB DATE Aug 79
NOTE 140p.

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Career Choice; *Career Education; *Career Exploration; Drafting; Education Work Relationship; Employment; Employment Projections; Filmographies; Fused Curriculum; High Schools; *Industrial Arts; Interest Inventories; Job Search Methods; Manufacturing; Metal Working; *Occupational Information; Printing; Quality Control; Self Evaluation (Individuals); Technology; Woodworking

ABSTRACT

This manual is intended to aid high school industrial arts teachers to infuse career exploration and career education into the industrial arts curriculum. It relates the specific skills learned in various industrial art classes to various occupations, providing a means for students to "try on" occupations via projects and self-assessment. Following instructions to the teacher and to the student, the handbook is divided into six sections, with a total of nineteen units. Section 1 introduces the manual, and presents occupations which can be sampled in the school shop (printing, drafting, metal working, quality control and woodworking) in addition to instructions for sampling assembly work and motion and time-study analysis. Section 2 leads the student to knowledge of self: his or her interests, aptitudes, and personality characteristics, and shows him/her how to relate these traits to careers. Section 3 provides knowledge about occupations, explaining how to study and analyze occupations, how occupations are classified, how to match personal characteristics to career requirements, and what occupations will need workers. In section 4 technology is discussed from both a historical and future perspective, including early manufacturing processes, mass production, quality control, automation, and innovations. Section 5 explains how to prepare a resume and how to get a job and keep it, while the last section contains references and a list of career-exploration films. (KC)

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ED198286

Focusing Industrial Arts on Career Education

A Handbook for Industrial Arts Teachers and Students

By
H. Bert DiPaul

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Published by H. Bert DiPaul, August, 1979
1066 Brennan Drive
Warminster, Pa. 18974

Printed in the United States of America by North Wales Press, Inc.

CE027930

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Library of Congress Catalog Number 79-53500

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ACKNOWLEDGMENTS

Many thanks to the people who contributed to the preparation of this manual. Among them are my good friends and colleagues, Gary and Geraldine Sproesser, who carefully read my rough draft and encouraged me to have it published; Walter Voelker, my esteemed friend, who suggested some changes in the sequence in which the material was presented; and my fellow industrial arts teacher, Charles Schlegel, whose constructive criticism undoubtedly helped to make this manual more useful to industrial arts teachers and students.

In additon to my friends and colleagues, many of my students at Abington High School had a positive influence on the inception and writing of this manual. By expressing a keen desire for career education, they helped to convince me of the need for a book of this nature.

Finally, my fifteen-year-old son, Robert, made a contribution by acting as a guinea pig in estimating the level of difficulty of the language used. He read the rough draft of every unit and told me if it contained any words or phrases which he did not understand.

DEDICATION

Dedicated to my son, Robert, a high school student searching for a career, to all the high school students facing the same problem, and to all the school teachers and counselors who will do their utmost to help these young people select a career.

ABOUT THE AUTHOR

Mr. DiPaul is a graduate of the University of Pennsylvania, B.S., Temple University, Ed.M. He also studied jewelry making and sculpturing at Tyler School of Art. He is presently employed by the Abington School District. He holds professional certificates from the Pennsylvania Department of Education for the following: Guidance Counselor, Industrial Arts—Instructional II, Supervisor of Industrial Arts, and Coordinator of Vocational Education. Mr. DiPaul spent 16 years in industry in various capacities including the position of Training Director. He is author of several magazine articles including one on education entitled "What's Wrong with Industrial Education", published by the *Pennsylvania School Journal*, 1970.

FOREWORD

To the Teacher:

Career education is a major link between social needs and social improvement because it provides high returns to both society and the individual. It helps the individual by guiding him toward an appropriate career goal; it helps society by providing successful employees whose success is due to career education which stresses selective training according to ability, interest, and personality traits. Thus, it is of utmost importance to provide career education in all public schools, since it benefits society as well as the individual.

This book should serve as an impetus to career education, by making it an indivisible part of the shop experience of every boy and girl in our schools. The industrial arts shop lends itself beautifully to the sampling of various occupations through the concept of hands-on-experiences. While the students are working on metals, plastics, woods or any other materials — whether they are engaged in manufacturing, construction or drafting — they are sampling various occupations. But the students may not be aware of this fact unless the instructor directs their attention to the significance of their experience in terms of occupations and careers. This book shows you, the instructor, how you can focus the students' shop experience on occupational sampling and career education. It can also serve as a guide in preparing a proposal for federal funding of industrial arts education under Title X of the Vocational Education Act of 1972.

Career education is not a newcomer to the educational scene. In 1906, Frank Parsons wrote a book entitled *Choosing a Career*, hoping to reduce the number of students who drop out of school without a vocational goal. Despite Mr. Parson's efforts and the good intentions of most of the guidance counselors, many students are still leaving school without knowing what occupation is best fitted to their abilities and interests.

To infuse career education into your present industrial arts program, make a list of all the occupations which can be sampled by the students in your shop. Unit 3 contains five sample lists (pp. 27-31) to help you enumerate the occupations appropriate for your

shop. Select the list which relates to your subject and use it as a guide in preparing your own. In reviewing the shop facilities, list as many occupations as possible. Even if only a few skills of a trade can be sampled in your shop, the occupation should be added to your list. *The Dictionary of Occupational Titles* can also be used as an aid in preparing your list.

Inexpensive tool kits can be prepared to try-out occupations involving tools and materials not common to the school shop. Unit 4 (pp. 32-38) illustrates this point. As shown in Unit 4, a lesson plan is prepared including objectives, tools and materials required, procedure, operation sheets, required drawings, and evaluation.

A similar example is shown in Unit 15 (pp. 103-112). This unit was prepared to give the students the opportunity to sample quality control work. The tools for sampling this occupation are stored in the drawer of an old mechanical drawing table which is the work station for quality control. Similar kits are being prepared by the author to sample locksmithing and stained glass work.

The occupational experience of the students should be broadened with plant visits, speakers from various industries, films and class discussions.

To the Student:

This book has been prepared to serve you, especially if you are planning to go to work right after graduating from high school. It contains information you must know about occupations and people before you can make an intelligent career selection. It describes how occupations are classified, the requirements of various occupations, and how you can appraise your own personality traits and match them to career requirements. It also demonstrates how to analyze an occupation to determine its advantages and disadvantages.

By reading this book carefully and by completing the review at the end of each unit, you will learn much about industry and the many occupations from which you can choose. Why learn about occupations? Because you need such information to make a wise occupational choice. Furthermore, occupations are constantly changing, and by learning about new developments you can anticipate some of the changes and prepare yourself for them. Many occupations of today did not exist twenty-five years ago and may not exist twenty-five years from now. Most jobs are becoming more complex, consequently, more training and education is necessary for today's vocations.

This book tells you about the opportunities that are available to you in the working world. It shows you how you can discover the career in which you can excel. Every student can be very good in at least one occupation. But to bring out the best that is in you, you must know your strengths, your interests, and your abilities. The key to your success is to identify your interests and your innate or natural abilities, and use them in a career that will bring you satisfaction and fulfillment.

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SECTION I

Introduction to Career Education

Unit 1 How To Use This Manual

1. Read the table of contents and skim the entire book quickly to get acquainted with the type of information it contains.

2. Complete units one to three and answer the review questions.

3. Select a tentative career from the list of occupations in Unit 3 before starting any shop work. For example, if you are taking metal shop, turn to page 29, and select the occupation which appeals to you most in regards to the tools and materials used, and the type of skills required.

4. If you are not sure that the occupation of your choice can be sampled in the school shop, consult the industrial arts teacher.

5. After selecting a tentative career, look in the *Dictionary of Occupational Titles* for a description of the type of work which a person employed in that occupation performs.

6. Pick out a project or work sample which requires the use of tools and materials normally used in the occupation you have tentatively selected. For example, if you have chosen to explore ornamental iron work as a career, you may make a pair of book ends, a bracket, or a stairway railing. The complexity of the project is determined by your previous experience. (See Figures 1.1, 1.2, and 1.3 on pages 18, 19 and 20.)

7. After making a sketch of your project, outline the procedure, get the materials and tools required, and make the product according to plans. As you complete each project, discuss it with your industrial arts teacher so that together you can evaluate your ability in the occupation you are sampling. What is the quality of your workmanship? How long did it take you to complete the project? What level of ability does your performance indicate?

8. As you work on the various products, you are sampling the occupation of your choice. This experience will provide you with positive or negative feedback which will either strengthen or weaken your choice. If the experience is enjoyable, satisfying, and generally pleasant, it will strengthen your occupational choice. This type of experience is called positive feedback. If the experience is frustrating, displeasing, and generally distasteful; it will weaken your choice. This type of experience is called negative feedback.

9. If you received mostly positive feedback while completing your first project, you may select a second object which requires the same tools and materials. If you get a feeling of satisfaction with positive feedback while completing the second project, select a third product pertaining to the same occupation. If you continue to get enjoyment and positive feedback and are able to do a good job, you may have found a suitable career. Continue to explore the occupation in the shop while studying the rest of this manual. Thus, you can explore every aspect of your tentative career.

10. If you received negative feedback while completing your first project, explore another occupation until you find the one that matches your interests and abilities, and satisfies your needs.

11. If you selected a career before reading this handbook, you should use the school shop for further exploration. Select two projects which require the use of tools and materials normally used in the occupation you have chosen. If you get only positive feedback while working on these products, your choice is appropriate. If you get negative feedback, your choice should be carefully reviewed as it may be inappropriate.

12. If the career which you have selected is not on the list of occupations which can be sampled in the school shop in which you are presently enrolled, you may select an occupation which is closely related to your career. If you cannot find such an occupation, discuss your chosen career with the industrial arts teacher. The teacher may know a way to explore it in another school shop or in the industrial community.

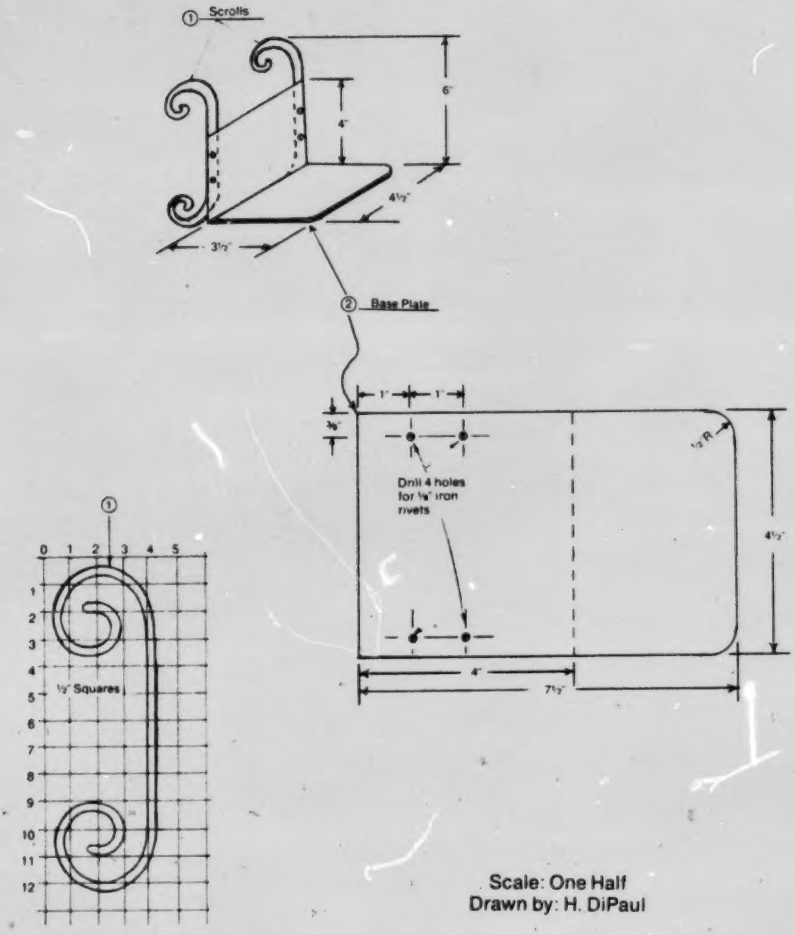
13. Complete Units five to twelve as you work on projects in the shop. Thus, you'll be using the shop as a laboratory to discover your interests, your abilities, and your needs. The knowledge you gain in reading and completing the exercises in this book will help you to select the career which is best suited to you.

14. To gain some understanding of how modern technology developed and what you can expect in the future, complete Section IV, units 13, 14, 16 and 17.

15. Units 4 and 15 require the use of special tools and equipment; therefore, separate tool kits have been prepared for these units. Only the students who decide to try out the occupations of *sampler, motion and time-study analyst,* or *quality control* will have to complete these units.

16. To learn how to plan for employment, how to prepare a resume, and how to obtain and hold a job, complete section V, units 18 and 19.

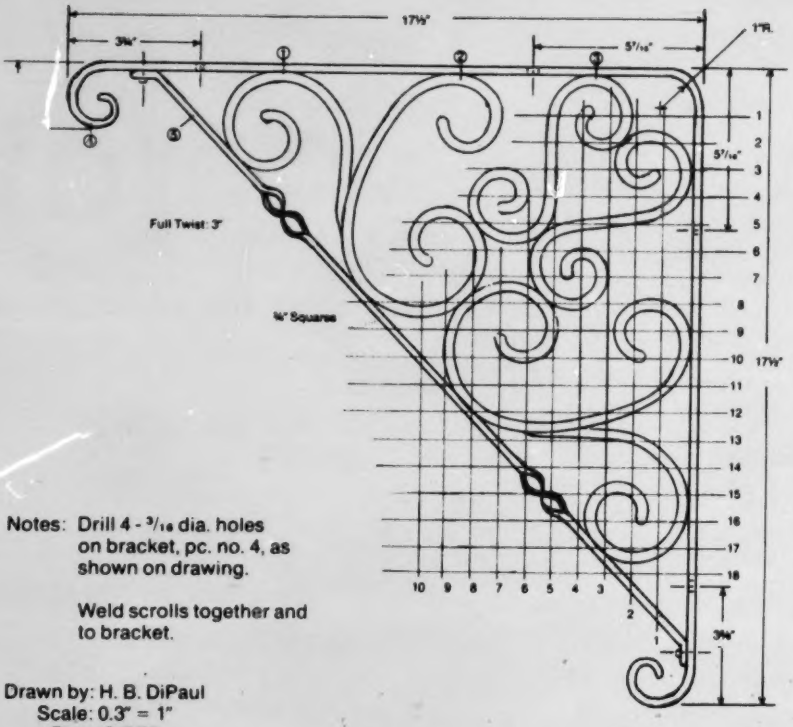
FIG. 1.1—BOOK ENDS



Scale: One Half
Drawn by: H. DiPaul

Pc. No.	Description	Quan.	Material	Size
1	Scrolls	4	H. R. S.	½ x ¾ x 13½
2	Base Plate	2	20ga steel	4½ x 7½

FIG. 1.2—BRACKET



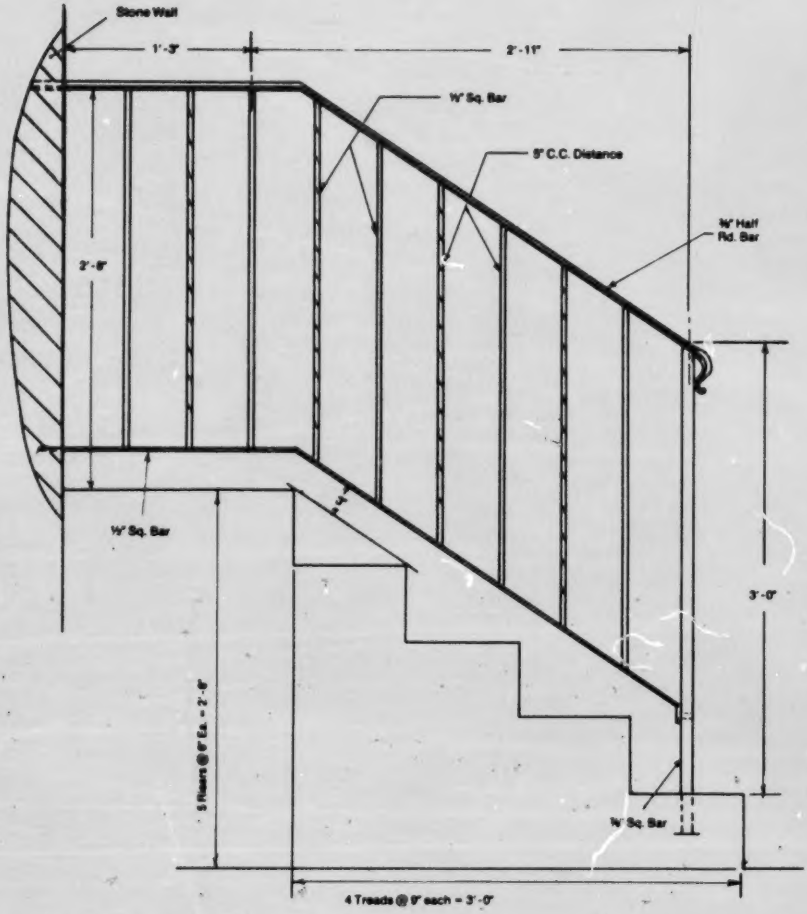
Notes: Drill 4 - 3/16 dia. holes on bracket, pc. no. 4, as shown on drawing.

Weld scrolls together and to bracket.

Drawn by: H. B. DiPaul
Scale: 0.3" = 1"
Date: 7-7-78

BRACKET				
Pc. No.	Description	Quan.	Material	Size
1	Scroll	2	H.R.S.	⅛ x ¾ x 10½"
2	Scroll	2	H.R.S.	⅛ x ¾ x 20"
3	Scroll	2	H.R.S.	⅛ x ¾ x 14¼"
4	Bracket	1	H.R.S.	3/16 x ¾ x 43"
5	Brace	1	H.R.S.	3/16 x ¾ x 25"

FIG. 1.3—STAIRWAY RAILING



Note: Weld ½" Sq. Bars to Railing

Scale: 1½" = 1 ft.

Drawn by: H. B. DiPaul

Do's

Do make Xerox copies of the following parts of the textbook:

1. Curve of Personality Characteristics
2. Rating Scale for Personality Characteristics
3. Outline Form for Analyzing an Occupation
4. Sample Resumé
5. Sample Letter Responding to a Newspaper Want Ad

Do take time to study personality in order to get to know yourself well:

1. To learn your strengths and weaknesses
2. Discover your interests and abilities
3. Know the results of your: Interest Inventories Scholastic Aptitude Tests General Aptitude Test Battery
4. Know your habits, aptitudes, and your personality characteristics

Do browse through the *Dictionary of Occupational Titles* — DOT, and the *Occupational Outlook Handbook* — OOH, to become familiar with the types of information they contain.

Don'ts

Don't write on any parts of this textbook.

Don't mark the rating scale in this book.

Don't mark any part of the Outline Form for Analyzing an Occupation in Unit 10.

Don't use the Rating Scale for Personality Characteristics before studying Unit 7.

Don't complete the outline for analyzing an occupation in Unit 10 until you look up the occupations which appeal to you in the DOT and the OOH.

Don't complete the outline for analyzing an occupation in Unit 10 until you look up the occupations which appeal to you in the *DOT* and the *OOH*.

Unit 2 Plan and Purpose of This Manual

OBJECTIVES or AIMS

After completing this unit you, the student, should be able to:

- Define career education.
- Explain why career selection is such an important decision in your life.
- State five of the twelve general objectives of this manual in your own words.

PRINCIPAL AIM

The principal aim of this manual is to promote career education in our secondary schools. By infusing career education into our industrial arts programs, all students will have the opportunity to study career education by choosing industrial arts as an elective. These students will thus be able to make wise career choices when they graduate from high school: choices which are based on knowledge of the occupations avilable, the requirements of these occupations, and the qualifications he or she possesses to meet these requirements.

GENERAL OBJECTIVES

The following objectives will give the student an insight into the subject matter of this manual. These aims will be achieved by using the tools, equipment, and materials in the school shops to explore and discover the student's personal interests, abilities and aptitudes. Furthermore, films, class discussions, plant visits, and the specific career information contained in this manual will be utilized in conjunction with the shop work to realize these objectives.

1. To discover and identify personal interests, abilities, and aptitudes by sampling, in the school shops, occupations which appeal to the student.

2. To develop and demonstrate the ability to relate personality traits, including physical and cultural characteristics, to job

requirements through class discussions and by completing units five to eleven.

3. To develop and demonstrate the ability for self-evaluation through class discussions and by completing units five to seven.

4. To develop and demonstrate realistic vocational goals through class discussions and by completing units five to twelve.

5. To be able to use the *Occupational Outlook Handbook* to discover career opportunities which exist throughout the United States, and to investigate local opportunities by visiting the plant or business establishment.

6. To develop and demonstrate the ability to analyze and classify occupations through class discussions, using the *Dictionary of Occupational Titles* effectively, and by completing units eight to ten.

7. To demonstrate the ability to evaluate various occupations in terms of favorable and unfavorable characteristics by completing unit ten.

8. To demonstrate sufficient understanding of mass production and production analysis to make a flow process chart of a shop project.

9. To be able to explain the effect of automation on the character of the labor force.

10. To be able to explain why future occupations will require higher levels of related knowledge and general education.

11. To demonstrate the ability to select a career based on self-evaluation and job evaluation by sampling occupations in the school shops and the industrial community, and by completing the exercises in this book.

12. To develop and demonstrate the ability to prepare a per-

sonal data sheet or resumé, to answer want ads, and to apply for jobs by completing units 18 and 19.

CAREER EDUCATION DEFINED

What is career education? There are many definitions, but few are more meaningful than the one which is given in a recent government publication entitled, *Career Education, a Handbook for Implementation:* "Career education is the total effort of public education and the community aimed at helping all individuals to become familiar with the values of a work-oriented society, to integrate these values into their personal value systems, and to implement these values in their lives in such a way that work becomes possible, meaningful, and satisfying to each individual." The student who likes a shorter definition may prefer the following: Career education is the blending of academic and vocational education leading to successful employment in an occupation which is meaningful and satisfying.

STUDENT'S PERSONAL RECORDS

Before you select a career, you must know yourself well — your strengths and weaknesses, your abilities and interests. Test results, experiences such as summer and weekend jobs, visits to industries, and the advice of your teachers and people who know you well must be weighed together to help you determine your vocational goal. You must keep an accurate record of your test results such as the General Aptitude Test Battery (GATB), Interest Inventories (Strong's or Kuder's), Scholastic Aptitude Tests, and the Career Maturity Inventory (CMI). This textbook can help you relate all your high school experiences to your vocational goal if you follow its recommendations.

REVIEW: The review items listed below have been answered to show the student how the other review items at the end of each unit are to be answered.

1. Define career education in your own words.
   a. Career education is the combined effort of the school, the home, and the community to help the individual select

and obtain the type of work which is meaningful and satisfying to him and of value to society.

b. Career education is the blending of academic and vocational education leading to successful employment in an occupation which is meaningful and satisfying.

2. Explain why career selection is such an important decision in your life.
   a. Because it affects your life-style and your future.
   b. Your success or failure depends on choosing the career that is best suited to you.

3. Select five of the ten objectives listed in this unit and state them in your own words.
   a. To discover personal interests, abilities, and aptitudes while using tools, materials, and machines to try out an occupation of your choice.
   b. To learn to relate personality traits to job requirements.
   c. To develop suitable and realistic vocational goals.
   d. To learn to classify and analyze occupations.
   e. To learn to make and use a flow process chart.

The following unit contains five lists of occupations which students can try out in school shops. Most of the high schools which the author visited have facilities in their print shops which students can use to sample the occupations listed under Graphic Arts or Printing Occupations. The cluster of crafts and professions listed under Mechanical Drawing or Drafting Occupations may be sampled in any mechanical drawing room with the help of a concerned teacher. The occupations listed under Metalworking Occupations as well as those listed under Quality Control or Inspection Occupations can be sampled in the metal shop at Abington High School and in most high schools which the author visited if the teacher is resourceful. The same is true about the list of Woodworking Occupations.

As mentioned in the "Foreword" of this textbook, every teacher who wants to infuse career education into his industrial arts program must prepare a list of occupations which can be sampled in his school shop. The cluster of occupations which can be sampled in any shop will vary according to the equipment in that shop. The following sample lists may be used as guides to help the teacher in

preparing the list for his particular shop. The teacher of electricity, electronics, plastics, or any other subject can prepare a similar list to represent the occupations which can be sampled in his school shop. He can use the DOT for the correct occupational titles, and the lists in the next five pages as samples.

Unit 3 Occupations Which Can Be Sampled in the School Shops

Code numbers from the *Dictionary of Occupational Titles* (DOT) are given after each job title for quick reference to the DOT description. Alternative tities are given after the code numbers.

GRAPHIC ARTS or PRINT SHOP OCCUPATIONS

Compositor (print. & pub.) 973.381-010. Typesetter; typographer.

Cylinder-Press Feeder (print. & pub.) 651.686-010. Cylinder-press operator helper; flat-bed-press feeder.

Etcher, Hand (print. & pub.) 971.261-010.

Offset-press Operator (print. & pub.) 651.482-010. Lithographic press operator.

Photographer, Lithographic (print. & pub.) 972.382-014. Lithographic-camera operator; photographer, wet plate; photolithographer; photolithographic process worker.

Photographer, Photoengraving (electronics; print. & pub.) 971.382-014. Contact-frame operator; engraving photographer.

Photoengraving Printer (print. & pub.) 971.381-034. Proof-plate maker; stripper and printer.

Photolettering-Machine Operator (print. & pub.) 652.585-010. Typesetter.

Platen-Press Operator (print. & pub.) 651.362-018.

Proofreader (print. & pub.) 209.387-030.

Transferer (print. & pub.) 972.381-026.

MECHANICAL DRAWING or
DRAFTING ROOM OCCUPATIONS

Aeronautical Engineer (profess. & kin.) 002.061-014

Architect (profess. & kin.) 001.061-010

Architect, Marine (profess. & kin.) 001.061-014

Civil Engineer (profess. & kin.) 005.061-014

Design-Engineer, Agricultural Equipment (profess. & kin.) 013.061-018

Drafter, Aeronautical (profess. & kin.) 002.261-010

Drafter, Architectural (profess. & kin.) 001.261-010

Electrical Engineer (profess. & kin.) 003.061-010

Engineering Assistant, Mechanical Equipment (profess. & kin.) 007.161-018

Engineering Development Technician (aircraft-aerospace mfg.) 003.161-014

Landscape Architect (profess. & kin.) 001.061-018

Mechanical Engineer (profess. & kin.) 007.061-014

Mechanical-Engineering Technician (profess. & kin.) 007.161-026

Structural Engineer (const.) 005.061-034

METAL SHOP OCCUPATIONS

Assembler, Product (mach. shop) 706.684-018. Assembler; erector.
Buffer (any ind.) 705.684-014.
Gas-Engine Repairer (any ind.) 625.281-026.
Glazier, Stained Glass (glass prod.) 779.381-010. Glazier artist.
Heat Treater (heat treat.) 504.682-018.
Industrial Engineering Technician (profess. & kin.) 012.267-010.
Inspector, Floor (mach. shop) 609.361-010.
Instrument Maker (any ind.) 600.280-010. Mechanical technician.
Jeweler (jewelry) 700.281-010. Bench worker; jewelry jobber; jewelry repairer.
Locksmith (any ind.) 709.281-010. Lock expert.
Machinist (mach. shop) 600.280-022. Machinist, all-around.
Maintenance Machinist (any ind.) 600.280-042. Machine repairer.
Model Maker (aircraft-aerospace mfg.) 693.361-010.
Ornamental-Metal Worker (fabric. metal prod.) 619.260-008. Art metal worker.
Polisher (jewelry) 700.687-058. Rubber-off.
Quality-Control Inspector (cut. tools) 701.261-010.
Sculptor (profess. & kin.) 148.061-018. Statue maker.
Sheet-Metal Worker (any ind.) 804.281-010. Sheet-metal mechanic.
Silversmith (silverware) 700.281-022.
Solderer (jewelry) 700.381-050.
Spinner, Hand (any ind.) 619.362-018. Spinning-lathe operator.
Teacher, Industrial Arts (education) 091.221-010. Shop teacher.
Toolmaker (mach. shop) 601.280-042.
Tool Grinder (any ind.) 701.381-018. Cutlery grinder, tool sharpener.
Welder, Gas (welding) 811.684-014. Welder, oxyacetylene.

QUALITY CONTROL or INSPECTION OCCUPATIONS

Inspection Supervisor (mach. shop) 609.131-010. Inspector, chief; quality-control supervisor.

Inspector, Quality Assurance (gov. ser.) Procurement inspector.

Inspector (forging) 612.261-010. Inspector, hot forgings.

Inspector (iron & steel) 619.381-010. Product inspector; steel inspector.

Inspector (jewelry) 700.687-034.

Inspector and Tester (agric. equip.) 624.361-010. Mechanical inspector; tester.

Inspector, Bench Assembly (aircraft-aerospace mfg.) 806.281-026.

Inspector, Fabrication (aircraft-aerospace mfg.) 806.361-022.

Quality-Control Engineer (profess. & kin.) 012.167-054.

Quality-Control Inspector (cut. tools) 701.261-010.

WOOD SHOP OCCUPATIONS

Airplane Woodworker (aircraft-aerospace mfg.) 769.281-010. Assembler; bench assembler; major assembler.

Cabinetmaker (woodworking) 660.280-010. Carpenter, bench.

Carpenter (const.) 860.381-022.

Carpenter Inspector (any ind.) 860.261-010.

Carpenter Maintenance (any ind.) 860.281-010. Carpenter, repair; carpentry repairer.

Carpenter, Rough (const.) 860.381-042. Bracer.

Carver, Hand (furn., plan. mill) 761.281-010. Wood carver, hand.

Casket Assembler (mort. goods) 739.481-010. Fitter.

Furniture Assembler (furn.) 763.684-038. Parts assembler.

Furniture Finisher (woodworking) 763.381-010. Coater; furniture refinisher.

Joiner (ship, boat bldg. & rep.) 860.381-050. Boat joiner.

Machinist, Wood (woodworking) 669.380-014. Woodworking machine operator.

Model Maker, Wood (any ind.) 661.380-010.

Patternmaker, Wood (found.) 661.281-022.

Shipwright (ship, boat bldg. & rep.) 860.381-058. Carpenter, ship; woodworker.

Unit 4 Lesson Plan

SUBJECTS: *Sampling Assembly Work and Motion and Time-Study Analysis*

OBJECTIVES

1. To have two students sample two occupations: One student will try out *Assembler*, machine products, the other student will try out *Motion and Time-Study Analyst*.

2. To discover the student's interest and aptitude as an assembler of machine products.

3. To discover the student's interest and aptitude as a motion and time-study analyst.

TOOLS AND MATERIALS REQUIRED

1. One globe valve
2. One gate valve
3. One miniature bench
4. One 10" adjustable open-end wrench
5. One screw-holding screw driver
6. One stop watch
7. One clip-board with several observation sheets, and pencil
8. One packet containing lesson plan, drawings and instruction sheets

PROCEDURE

1. Two students will work together: One will be sampling the occupation of ASSEMBLER (machine products), the other will be sampling the occupation of MOTION AND TIME-STUDY ANALYST.

2. Obtain Tool Kit No. 1 and check to see that the required tools and materials listed above are in the kit. (Report any defective tools to the instructor before using them).

3. Study lesson plans and assembly drawings for each valve and for the miniature bench. Try to understand how the parts fit together before disassembling the valves or the bench.

4. Arrange the required tools and materials so they can be reached with ease to avoid lost time or motion. The student sampling motion and time-study should be familiar with the principles of motion economy. (See Unit 14 of Textbook: *Focusing Industrial Arts on Career Education).*

5. The assembler will disassemble and reassemble the gate valve, globe valve, and miniature bench. The motion and time-study analyst will make a stop-watch time study for each product.

6. The motion and time-study analyst will record the time for each operation in the observation sheet. He will also record the total time for disassembling each product and for re-assembling each of the three products (Gate valve, Globe valve, & Bench). Use the stop watch provided in the kit for timing the operation.

7. After assembling each valve, the assembler will test the valve to see that it opens and shuts freely and that it does not leak when closed. (Place a clean handkerchief on one side of the valve and try to blow air through the valve).

8. After completing the required operations, the assembler will clean the tools and equipment used, replace them in the assembler kit, and return the kit in good order to the teacher. The motion and time-study analyst will see that the stop watch is in good working order but in the stopped position, remove the used observation sheets from the clipboard, and return both items to the teacher. He will also place the drawings in the folder and return them to the teacher.

EVALUATION

1. Each student will get his performance rated by the teacher as A (average), AA (above average), BA (below average).

2. Each student will also compare his work with standards developed by the performance of previous students.

3. Each student will analyze his work in terms of positive or negative feedback. (See Unit-1 of Textbook: *Focusing Industrial Arts on Career Education).*

4. After discussing his experience with the teacher, each student will select a second project involving the same occupation, or a project to tryout a different occupation.

OPERATION SHEET — VALVE ASSEMBLY and DISASSEMBLY

Operations — Disassembly	*Time in Decimal Seconds*
Place valve in smooth-jaw vise	
Remove handwheel nut	
Remove handwheel	
Remove packing nut	
Remove gland	
Remove body-flange-nut	
Remove stuffing box	
Remove stem	

Operations — Assembly	*Time in Decimal Seconds*
Place valve body in vise	
Screw stem in stem guide	
Place guide & stem into body	
Screw body-flange-nut on body	
Place gland over stuffing box	
Screw packing nut in place	
Place handwheel on stem	
Screw handwheel-nut in place	
Close valve	
Remove valve from vise	
Test valve for leaks	

OPERATION SHEET — BENCH ASSEMBLY and DISASSEMBLY

Operations — Disassembly	*Time in Decimal Seconds*
Place bench upright in smooth-jaw vise: Hold lower-center slat between jaws.	
Unscrew and remove seat slats	
Unscrew and remove back slats	
Unscrew and remove front slat	
Unscrew and remove center slat	
Unscrew and remove back pieces	
Unscrew and remove cross pieces	

Operations — Assembly	*Time in Decimal Seconds*
Screw lower-center slat to cross pieces	
Screw cross pieces to back pieces and seat	
Screw front slat to ends	
Screw back slats to back pieces	
Screw seat slats to seats	
Tighten all screws	

FIG. 1 — GATE VALVE ASSEMBLY

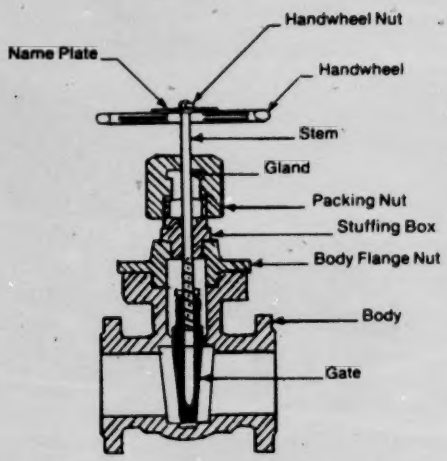
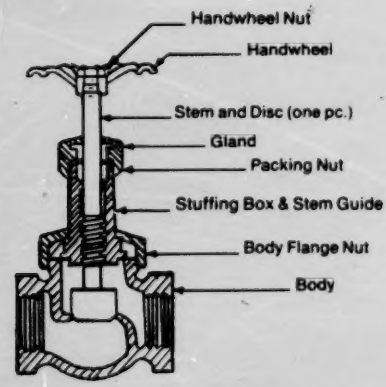


FIG. 2 — GLOBE VALVE ASSEMBLY



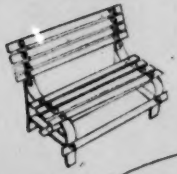
Note: These valves were purchased for one dollar each at a garage sale.

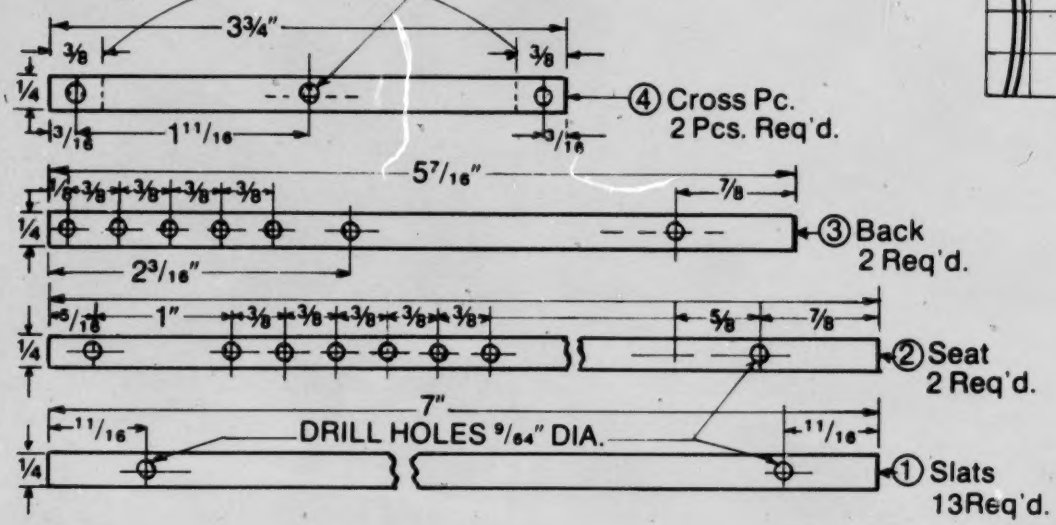
Drawn by: H. Bert DiPaul

Date: 4-12-79

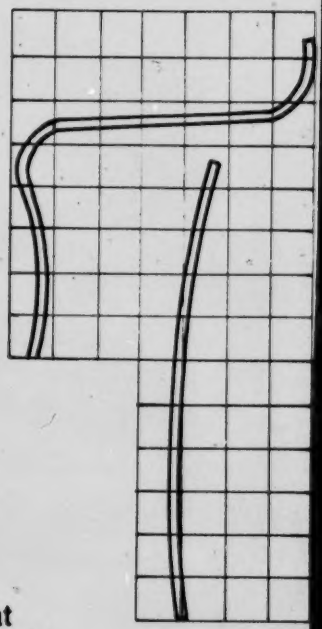
BENCH — MATERIAL (1/4 x 3/32 C.R.S.) SCALE: FULL SIZE
ASSEMBLY DRAWING (Scale: 1" = 10")

Drawn by: H. B. DiPaul





¼" Squares



SECTION II

Knowledge About Self

Unit 5 Interests and Aptitudes

OBJECTIVES

After completing this unit, you should be able to:

- Define an interest and name five types of interests.
- Define aptitudes and name six types of aptitudes.
- Identify four of your own aptitudes and four interests.

INTERESTS

An interest, as defined by Bingham,[2] is a tendency to become absorbed in an experience and to continue it. Interests have been studied by many, especially by Strong, Kuder, and Cottle. Some of the interests they have identified are: Scientific, computational, persuasive, artistic, literary, musical, social service, clerical, mechanical, and outdoor. Cottle's studies[3] suggest that interest factors are bipolar in nature, that is, a positive preference for one type of work is associated with a dislike of a contrary type of work. For example, those who like working with people generally dislike working with things and vice versa.

APTITUDES

Aptitudes are specific abilities which make the learning of a job or task easier. Aptitudes have been studied and classified for two main reasons: (1) to make available to employers the largest number of workers who qualify for various jobs, (2) to make available to workers as many jobs as possible for which they are suited. Evaluation of aptitudes is essential to match individual qualifications to job requirements.[4]

Eleven aptitude factors have been identified and defined as follows:

V — Verbal: Ability to understand meanings of words and ideas associated with words.

N — Numerical: Ability to perform arithmetic operations.

S — Spatial: Ability to visualize objects of two or three dimensions, or think visually of geometric forms.

P — Form Perception: Ability to perceive details in objects or pictures and notice slight differences in shapes and lines.

Q — Clerical Perception: Ability to proofread words and numbers, and to avoid errors.

K — Motor Coordination: Ability to coordinate eyes with hands or fingers and make precise movements with speed and accuracy.

F — Finger Dexterity: Ability to manipulate small objects with fingers and make precise movements with speed and accuracy.

M — Manual Dexterity: Ability to control hands skillfully in placing and turning motions.

E — Eye-Hand-Foot Coordination: Ability to coordinate the movements of hand and foot in accordance with visual stimuli.

C — Color Discrimination: Ability to recognize similarities or differences in colors, or in shades, or values of the same color.

G — Intelligence: Ability to understand instructions and the underlying principles, scholastic ability.

Why are interests and abilities very important factors in selecting a career? Because if you are interested in an occupation, and you have the ability to learn the skills required to do the job well, you are almost certain to succeed in that vocation if you can get a job in it. When a person has a calling to be a doctor, teacher, or nurse, he invariably displays a high degree of interest and ability for that vocation.

A word of caution against putting too much emphasis on the results of vocational interests inventories is necessary. Many public schools administer such inventories to all students. While interest in an occupation is important, interests without ability will not guarantee success in any job. Neither interest patterns similar to those of a successful lawyer, nor a high degree of interest in law can guarantee success as an attorney if one lacks the capacity to learn the knowledges and skills of that profession.

APTITUDES and OCCUPATIONS

V — Verbal: Lawyer, teacher, counselor, minister
N — Numerical: Accountant, chemist, estimator, machinist
S — Spatial: Architect, dentist, engineer
P — Form Perception: Draftsman, decorator, fingerprint classifier
Q — Clerical Perception: Proofreader, stenographer, machinist
K — Motor Coordination: Cutter, assembler, athlete, machinist
F — Finger Dexterity: Surgeon, watchmaker, engraver, packer
M — Manual Dexterity: Lathe operator, mechanic, dentist
E — Eye-Hand-Foot Coordination: Acrobat, ballplayer, taxicab driver
C — Color Discrimination: Artist, color-matcher, decorator
G — Intelligence: Doctor, chemist, engineer, teacher

REVIEW

1. What is an interest? Define it in your own words.
2. Name three interests which can be expressed verbally.
3. Name three interests which can be expressed through actions.
4. What are aptitudes?
5. Name six types of aptitudes.
6. What two factors are very important in selecting a career?
7. Identify four personal aptitudes which can be applied to career selection.
8. Identify five personal interests and relate them to two or more careers.

Unit 6 Relating Physical and Cultural Traits to Careers

OBJECTIVES

After completing this unit, you should be able to:

- Define a trait.
- Identify six physical traits.
- Relate the six traits to job requirements.
- Explain what causes cultural differences.
- Identify four cultural differences.

DEFINITION of a TRAIT

What is a trait? A trait is a person's distinguishing feature or characteristic. Traits may be subdivided into physical, cultural, or temperamental traits; however, they are all part of one's personality. To know yourself well, you must be familiar with your physical traits, cultural traits, and your total personality characteristics which include all of these. Although traits distinguish one person from another, some traits are common to a group of people. For example, many people may be strong; hence to say that one is strong does not make him different from all the others. Thus a trait may be a concept which is used to describe a number of people: fat or thin, strong or weak, neat or disorderly, noisy or quiet, bold or timid are examples of such traits.

OCCUPATIONAL REQUIREMENTS and INDIVIDUAL DIFFERENCES

Occupations, like people, differ from each other. They have different needs and requirements — some occupations require physical agility (acrobat) while others require mental agility (mathematician). Some occupations require precise, and delicate movements of hands and fingers (engraver); others require heavy or coarse movements (trash collector). Some vocations require working with people (counselors); others require working with tools or machines (machinist). People also have different needs and requirements — some like physical activity, others like mental activity; some like to work with people, while others like to work with machines or tools.

Therefore, by selecting and matching occupations and people we can satisfy the requirements of both.

While careful career selection is important, for most people several occupations can be found which fit their emotional and physical characteristics.[5] For example, a person with high mechanical aptitude who is interested in working with tools and machines may be employed as a machinist, millwright, auto mechanic, motorcycle mechanic, maintenance mechanic, toolmaker, instrument maker, and other related occupations. Thorough knowledge of alternative career choices will enable you to manipulate the labor market. For example, if you want to be a machinist, but the only jobs available are auto mechanic, millwright, or locksmith; you may select millwright because it is more closely related to the machinist trade than the others. This is the essence of career education according to a very recent handbook put out by the U. S. Department of Health, Education, and Welfare.[6]

PHYSICAL CHARACTERISTICS

Physical characteristics such as height, weight, eyesight, hearing, voice, manner of speaking, age, level of energy, and general health will be discussed first. Each of these traits can be related to occupations such as policeman, basketball player, football player, or jockey. Being short is not a limitation in the majority of occupations except for a few occupations where height is important. Height cannot be changed, but weight should be adjusted to height. Most employers prefer employees of normal weight, particularly where the public must be met or where the job requires ease of movement.

Eyesight, hearing and voice are all related to occupations in varying degrees. Good eyesight is essential for most occupations, but the majority of sight deficiencies can be corrected with glasses. Good hearing is an asset in most occupations but not always a requirement; some hearing deficiencies can be corrected with hearing aids. A pleasing voice is an asset in any occupation and essential in vocations involving public speaking such as radio or television broadcasting, entertaining, public relations work, and political careers. Training can improve the voice.

Age can be a limitation in some occupations, as employers like to hire people who have many productive years left. While youthfulness is usually an asset, it can be a limitation if one is less than 18 years of age, because minors are barred from hazardous occupations by law. Furthermore, one may lack the trade experience or education required for the job.

A high level of energy is an asset in any job. The amount of energy is usually related to one's general health and health habits. Good health habits include eating habits, sleeping habits, and physical exercise.

CULTURAL DIFFERENCES

In addition to physical differences, you must consider cultural and ethnic differences such as speaking with a foreign accent or wearing a turban instead of a hat. Cultural differences emanate from ways of thinking and doing which are different from one's own, such as a different language, religion, tradition, or family structure. These differences lead to different customs, manner of speech, or behavior patterns. Although such differences are not as closely related to occupational choice as physical characteristics, they must be given due consideration. As a prospective employee, you will eventually work with people of different racial and national origins. How well can you relate to people who dress, speak, and look different from you? Hopefully, you learned to appreciate cultural differences in the lower grades. For unless you learn to accept all people as people of worth, you may be unhappy at your job.

I'M OK — YOU'RE OK

Transactional Analysis is psychology's newest and most promising offspring.[7] It teaches that one must learn to feel OK about himself and to accept others as OK, too. If you learn to apply the "I'm OK — You're OK" philosophy in your everyday life, you will tolerate people whose ways of thinking and doing are different from yours. In a world where astronauts can circle the globe in less than two hours, you must broaden your horizons and think in terms of one world — a world united by the brotherhood of man. Then you

will be happy with yourself, with others, and with a career among people who are ethnically or racially different from you.

REVIEW

1. Define trait or characteristic (they are synonyms).
2. List six physical traits and relate them to job requirements.
3. Define cultural differences.
4. Name four factors which cause cultural differences.
5. What is the meaning of "I'm OK — You're OK" and how can it help to improve relations between people?

Unit 7 Personality Characteristics

OBJECTIVES

After completing this unit, you should be able to:

- Define personality in your own words.
- Explain what is meant by habit, attitude, value, beliefs, and sentiment.
- Give three or more examples of mild emotions and strong emotions.
- State two approaches to the measurement of personality.
- Explain why, in using a rating scale for personality traits, the rater should look for the behavior which depicts a trait rather than the trait.
- State three limitations or weaknesses of rating scales.
- Use the rating scale for personality characteristics at the end of this unit.
- Match personality traits to job characteristics in making a career choice.

PERSONALITY

An important phase of career education is to teach you how to appraise your own personality. But before you can do this, you must know what is meant by the word personality. Webster's New Collegiate Dictionary defines personality as:

a. The complex of characteristics that distinguishes an individual

b. The totality of an individual's behavior and emotional tendencies

Most psychologists agree that personality is allinclusive. It includes the total individual characteristics which make each person different from another person. Hurlock and Allport tell us that personality includes our habits, attitudes, values, beliefs, emotional states, sentiments, and motives.[8] Each of these elements of personality is explained below. They have a direct influence on your character, determining your reputation, your achievements, and your life-style.

According to Professor Noll, of Michigan State University, personality has two aspects: inner and outer.[9] The inner aspect refers to the adjustment of the individual within himself: What do you think of yourself? Are you secure, confident, and satisfied with yourself? Or are you insecure, timid, and not sure of your personal worth? The outer aspect of personality refers to the individual's relationship with other people. Do you get along with others? Do you have the respect and confidence of your peers? Are you capable of enjoying group activities?

PERSONALITY CHARACTERISTICS DEFINED

HABITS: A habit is a fixed pattern of behavior like biting your nails or chewing gum. There are many kinds of habits. Some are deliberately acquired like driving a car, or playing golf. Other habits are acquired indirectly through family and social interaction. Character is seldom, if ever, acquired directly or deliberately. Vicious habits such as excessive smoking, drinking, or overeating are harmful to the body. Annoying habits such as gum-chewing or rudeness often undermine friendship. Habits can make two types of persons, one which is a social liability, the other, a social asset. Good habits like dependability, cheerfulness, pride in a job well done, and consideration for others are avenues to a successful life. They will serve you for the rest of your life, just as surely as bad habits will hinder you unless you change them.

ATTITUDES: An attitude is a tendency to respond negatively or positively to situations or persons. For example, a student with a negative attitude toward school work finds all the school subjects dull and uninteresting. The student with a positive attitude, on the other hand, is fascinated by the study of science, social studies, and the arts because they give him an insight into the world around him. Attitudes are closely associated with feelings and emotions and are acquired early in life.

VALUES: A value is an estimate of worth which is based on feelings and emotions. Therefore, values are subjective and purely personal. There are many types of values, such as political values, social values, religious, moral, and aesthetic values. For example, what should be the order of importance of the following issues?

1. Congressional reform ..... Political value
2. Tax reform ..... Political, social
3. Welfare or Bussing ..... Social
4. Death Penalty ..... Social, Religious
5. Arms Limitation ..... Social, Religious
6. Improvement of Landscapes ..... Aesthetic

Generally speaking, something is more worthy or valuable if it satisfies wants more fully or if it satisfies more wants. For example, voting on election day should be more important than going to a football game because good government plays an important role in satisfying your wants. A person who can distinguish important issues from unimportant ones is said to have a good sense of values.

BELIEFS: A belief is what you believe about yourself and the world around you. Beliefs include ideas about the social and political order. For example, some people believe in socialism, while others believe in private ownership as the means of production. Some people believe in maintaining the family unit with close family ties, others want to dissolve the family.

EMOTIONAL STATES: An emotional state refers to a period of excited behavior during which an emotion such as fear or anger is being experienced. Emotions are of two types: the mild, pleasant, and aesthetic emotions such as joy, hope, and confidence; and the strong, disturbing emotions such as anger, fear, jealousy, and sorrow. The mild emotions have been shown to have a beneficial influence on bodily health and vigor, while the strong emotions have a detrimental effect. To promote mental efficiency and bodily health, you should cultivate the mild emotions.

Emotional control is an important phase of education. The way you respond to emotion is a result of habit. Proper management of emotions is accomplished by attaching other reactions to situations which incite violent emotions so the emotion does not start; for if a strong emotion gets started, it has already gone too far. If you have a tendency to get angry, find cheerful companions and engage yourself in a vigorous game of tennis. If you are subject to grief, read an interesting story, develop an interesting hobby, or become engrossed in attractive work.

SENTIMENTS: A sentiment is an idea colored by emotion such as love. A sentiment can also be a cluster of emotions or feelings grouped around an object such as love of family. Patriotism, religion, honor, school spirit, and loyalty are examples of sentiments. When a sentiment becomes thoroughly ingrained, it becomes a disposition. Sentiments are often used by hypocrites to hide dispositions that are opposite.

MOTIVES: A motive is an inner drive (hunger), a need (praise), or a desire (power) that causes a person to act. A motive can be external such as the desire for money or wealth, or internal such as the desire for recognition. Motives can also be personal or social. Some examples of personal motives are: (1) the drive to collect stamps or antiques, (2) the urge to travel, (3) the ambition to become a doctor, a lawyer, or an engineer, and (4) the desire to marry a particular person. Some common social motives are: (1) gregariousness—the desire to be or to live with others, (2) acquisitiveness—the motive to acquire and possess things, (3) self-assertion—the desire for recognition, and (4) pugnacity—the urge to fight.

INDIVIDUAL DIFFERENCES

Students of personality must become involved with individuality, for no two persons have the same personality. What makes each individual different from the other? Different parents, hereditary factors like genes and chromosomes, bodily makeup, and national origins; different family cultures, habits, experiences, and religions; different abilities, interests, and aptitudes; these are some of the factors that make individuals different from each other. As these differences are integrated and merged into an organized human being, they are acted upon by both internal and external forces which are also different. Consequently, personality differences tend to increase rather than decrease as the individual matures.

MEASUREMENT OF PERSONALITY

There are two fundamental approaches to the measurement of personality: the self-report approach and the observational approach. In the self-report method, you are presented with a list of statements from which you select those which express what you

think or how you feel about different things. In the observational method people who know you are asked about you — They select the statements which apply to you from a prepared list.

As you appraise the different aspects of your personality by the self-report method, try to be disinterested and see yourself as others see you. Your self-appraisal will be realistic only if you learn to view yourself objectively and unemotionally.

SPECIFIC PERSONALITY TRAITS

The characteristics listed below are first explained and then presented in a rating scale which can be used for either self-reporting or observational reporting. You can rate yourself first, then have a friend rate you; compare your own observations with those of your friend. But before using the scale, study the explanation for each trait in the following list. As you study each trait, try to determine to what degree it applies to you. For example, are you a very cheerful person or are you inclined to be gloomy? Are you sociable or unsociable, dependable or undependable?

1. Industriousness: Willingness to work, application of earnest, steady effort.

2. Punctuality: The habit of being on time.

3. Dependability: Readiness to meet obligations and responsibilities.

4. Perseverance: Ability to stick to a job until it is finished. Ability to continue in a given course despite difficulties.

5. Pride in a job well done: Deriving personal satisfaction from a job well done, appreciation for good-quality work.

6. Cheerfulness: The quality of being cheerful, animation, good spirits.

7. Sociability: Ability to get along with others, friendliness.

8. Self-control: Exercising restraint over one's own impulses, emotions, and desires; self-command.

9. Attitude: Tendency to respond negatively or positively to situations or persons.

10. Courtesy: Respect for and consideration of others, polite behavior.

11. Creativity: Ability to produce something new or different, originality.

12. Ability: Capacity to perform in general (may be scholastic, mechanical, or psychomotor).
    a. Scholastic refers to the ability to do school work.
    b. Mechanical refers to the ability to work with machines and tools.
    c. Psychomotor refers to the ability to coordinate eyes with fingers, hands, and feet.

13. Interest: Desire and readiness to participate in and to enjoy an activity, curiosity, involvement.

14. Integrity: Uprightness, honesty, sincerity; being of sound moral principle. According to Erik H. Erikson, integrity is an experience of worthiness which conveys some world order and a spiritual sense.

15. Values: Values refer to estimates of worth or degree of importance; values are concepts heavily weighted with emotion.

All of the traits described above are related to occupations in some degree. However, some traits are specifically required for certain occupations, while other traits are desirable in all occupations but not necessarily required in any of them. For example, pride in job well done is a highly desirable trait, but lack of it will not disqualify you for any job. On the other hand, lack of self-control or lack of sociability will disqualify you for certain occupations such as salesman, hostess, teacher, or counselor.

LIMITATIONS OF RATING SCALES

Before using the following rating scale, you should be cautioned about the use of and the limitations of rating scales.[10]

1. Raters have a tendency to be too generous.

2. There is a tendency to rate a person with a pleasing personality high on all points, and a rude or unpleasant person low on all points.

3. It is difficult to clearly define the trait to be evaluated.

4. Several observations are required to discern typical behavior.

5. Rate each person on the behavior which depicts the trait rather than the trait. A behavioral statement is likely to be more objective than a statement about a trait.

6. Rate each trait on the basis of behavior observed in as many situations as possible.

HOW TO USE THE RATING SCALE

Before using the Rating Scale for Personality Characteristics, you should understand its purpose; namely, to determine your strength or weakness for each of the traits represented. Consequently, determining the score for the entire test is unnecessary, for the total score is insignificant. Each trait should be rated separately without relating it to the others. The number of the column checked for each characteristic indicates its strength. For example, a check mark in column five indicates that you possess the highest possible degree of the trait in question. On the other hand, a check mark in column one indicates the lowest possible degree of that trait.

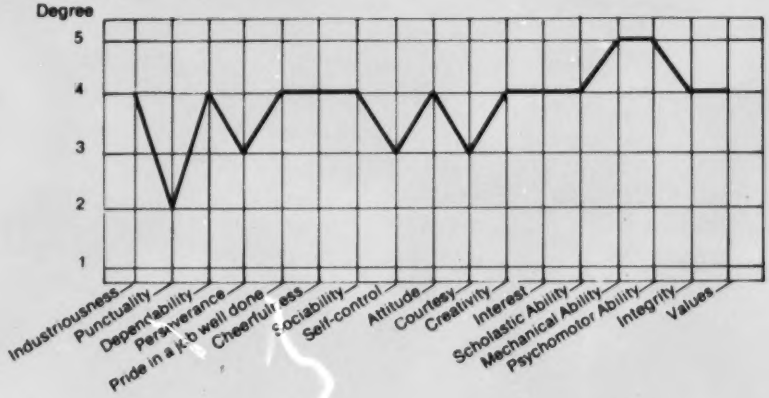
Either extreme of the scale may be unrealistic. For example, since human beings are not perfect, no one can honestly say that, in regards to sociability, he is always friendly or he is liked by everyone (column five). On the other hand, it is difficult to imagine someone who is never friendly or who is disliked by everyone unless he is

mentally disturbed (column one). The most common occurrence for the majority of students will be a check mark in column three which represents the middle score or median for each trait. However, you should not be influenced by this statement toward checking the middle column for any trait. Consider each characteristic separately and check the column which is most appropriate for you. In other words, check the column which most nearly matches your own behavior in regard to each trait.

RECOMMENDED PROCEDURE FOR USING THE RATING SCALE

1. Find the characteristic in the left-hand column.
2. Read the behavior which describes different degrees of the trait in columns five to one.
3. Consider the behavior for each trait carefully.
4. Check the column which best describes your behavior or the behavior of the student you are rating.
5. After rating all the traits, plot the score for each characteristic on a line graph similar to the one shown below.

CURVE OF CHARACTERISTICS



A curve of your personality characteristics, similar to the one shown above, should help you to select a career in which your best traits could be used to advantage.

INTERPRETING RESULTS

After rating yourself and carefully plotting the results on a curve, ask a person who knows you well, friend or relative, to rate you using the same scale. If the results are similar, you can assume they are objective and fairly reliable. If the results vary significantly, objectivity is lacking. In that case, ask a third person to rate you. Then select the two results which are similar and plot them for future reference as these are likely to be the reliable ones.

REVIEW

1. Define personality in your own words.
2. What is meant by the inner and outer aspects of personality?
3. Give the meaning of the following terms in your own words:
   a. Habit
   b. Attitude
   c. Value
   d. Belief
   e. Sentiment
4. Give three examples of mild emotions.
5. Give three examples of strong emotions.
6. Give two approaches to the measurement of personality.
7. Name three limitations or weaknesses of rating scales.
8. In using a rating scale for personality characteristics, should the rater look for a given trait or the behavior which depicts the trait? Why?

RATING SCALE FOR PERSONALITY CHARACTERISTICS

Characteristic	5	4	3	2	1
Industriousness or Diligence	Hard worker, seeks additional work when idle.	Works regularly but does not push himself.	Needs occasional prodding to get his regular work done.	Needs constant prodding to get his work done.	Very seldom works even with constant prodding.
Punctuality	Is always on time for work or appointments.	Is usually on time.	Is sometimes on time and sometimes late.	Is rarely on time.	Is never on time.
Dependability	Always meets obligations; is always available when needed	Usually meets obligations; is usually available when needed.	Meets obligations about half of the time; fails the other half.	Rarely meets obligations; is usually unavailable when needed.	Never meets obligations; is never available when needed.
Perseverance	Always completes a job; persists in an endeavor despite difficulties.	Usually completes a job, is seldom distracted from the original goal by discouragement.	Completes about fifty per cent of his tasks; is often distracted from original goal.	Seldom completes a job without being prodded; is easily distracted.	Never completes anything he starts without constant prodding.
Pride in a Job Well Done	Always strives for excellence; always derives satisfaction from a job well done.	Frequently strives for excellence; usually derives satisfaction from good workmanship.	Rarely strives for excellence; is satisfied with average performance.	Never strives for excellence; is satisfied with poor workmanship.	Enjoys careless and slipshod work; is annoyed by people who strive for excellence.

RATING SCALE FOR PERSONALITY CHARACTERISTICS

Characteristic	5	4	3	2	1
Cheerfulness	Is always smiling and full of good spirits; is always able to dispel gloom.	Is usually smiling and full of good spirits.	Is sometimes smiling and full of good spirits.	Is rarely smiling. Is usually sad and gloomy.	Is never smiling. Is always gloomy.
Sociability	Is always friendly and easy to get along with; is liked by everybody.	Is usually friendly and easy to get along with; is liked by most people.	Is sometimes friendly and likable; is liked by some, disliked by others.	Is rarely friendly and likable; is disliked by most people.	Is never friendly and likable; is disliked by everybody.
Self-control	Never gets angry; is always cheerful and pleasant; impulsive action is always restrained by reason.	Seldom gets angry; is usually cheerful and pleasant; impulsive action usually checked by reason.	Sometimes gets angry; is sometimes unpleasant; impulses not usually restrained by reason.	Often gets angry; is often unpleasant; is excitable and unreasonable at times.	Always gets angry; is always unpleasant, unreasonable, and very emotional.
Attitude	Always responds positively and enthusiastically to situations and people; is always optimistic.	Usually responds positively and enthusiastically to situations and people; is usually optimistic.	Sometimes responds positively and with enthusiasm to situations and people; is sometimes optimistic.	Usually responds negatively to situations and people; is usually pessimistic.	Always responds negatively to situations and people; is always pessimistic.

RATING SCALE FOR PERSONALITY CHARACTERISTICS

Characteristic	5	4	3	2	1
Courtesy	Is always polite and concerned about feelings of others; never offends anyone.	Is usually polite and concerned about feelings of others; seldom offends anyone.	Is sometimes polite and concerned about other people's feelings. Sometimes offends others.	Is seldom polite and is usually unconcerned about feelings of others; usually offends others.	Always impolite and unconcerned about feelings of others; habitually offends.
Creativity	Extremely gifted in discerning a new approach or creating a new design; is always original.	Somewhat gifted in discerning new ways of doing things; is usually original.	Has average ability in creating something new and different; is sometimes original.	Rarely comes up with new ideas or a new approach. Is seldom original.	Can only copy or reproduce other people's work; is never original.
Scholastic Ability	Always enjoys schoolwork. Has an "A" average in most school subjects.	Usually enjoys schoolwork. Has a "B" average in most school subjects.	Seldom enjoys schoolwork. Has a "C" average in most school subjects.	Never enjoys schoolwork. Has a "D" average in most school subjects.	Loaths schoolwork. Fails most school subjects.
Mechanical Ability	Always enjoys working with tools and machines; has an "A" average in shopwork.	Usually enjoys working with tools and machines; has a "B" average in shopwork.	Seldom enjoys working with tools and machines; has a "C" average in shopwork.	Never enjoys working with tools and machines; has a "D" average in shopwork.	Loathes working with tools and machines; always fails shopwork.

RATING SCALE FOR PERSONALITY CHARACTERISTICS

Characteristic	5	4	3	2	1
Psychomotor Ability	Always excels in activities involving coordinated movements of eyes, hands, and feet or any combination of these.	Usually excels in activities involving coordinated movements of eyes, hands, and feet, or any combination of these.	Sometimes excels in activities involving coordinated movements of eyes, hands, and feet or any combination of these.	Seldom excels in activities involving coordinated movements of eyes, hands, and feet or any combination of these.	Never excels in activities involving coordinated movements of eyes, hands, and feet or any combination of these.
Interest	Always desires to learn more about an activity or career; always ready to participate.	Usually desires to learn more about an activity or career; usually ready to participate.	Sometimes desires to learn more about an activity or career; usually ready to participate.	Rarely desires to learn more about an activity or career; rarely ready to participate.	Never desires to learn more about an activity or career; is never ready to participate.
Integrity	Is always trustworthy, honest, and just; never cheats, steals, or lies.	Is usually trustworthy, honest, and just; seldom cheats, steals, or lies.	Is sometimes trustworthy, honest, and just; sometimes cheats, steals, or lies.	Is seldom trustworthy, honest, and just; usually cheats, steals, and lies.	Is never trustworthy, honest, and just; always cheats, steals, and lies.
Sense of Values	Can always distinguish the important from the unimportant.	Can usually distinguish the important from the unimportant.	Can sometimes distinguish the important from the unimportant.	Can seldom distinguish the important from the unimportant.	Can never distinguish the important from the unimportant.

SECTION III

Knowledge About Occupations

Unit 8 How To Study Occupations

OBJECTIVES

After completing this unit, you should be able to evaluate various occupations in terms of favorable and unfavorable characteristics and make a realistic career choice. You will demonstrate this ability by:

1. Listing six of the eleven factors used in rating jobs.
2. Explaining how the point value system is used in job rating.
3. Listing three or more factors which should be considered in making a career choice.
4. Making a tentative career choice and showing how aptitudes, interests, and abilities should be matched to job requirements.

WHY STUDY OCCUPATIONS?

The study of occupations helps you to match your aptitudes, interests, and abilities with job requirements. In Unit 9 you will learn that the study of occupations is made easier if all jobs which call for similar skills are classified into groups. These groups are called "job families". For example, doctors, lawyers, pharmacists, teachers, and engineers all belong to the professional job family requiring a college degree or better. Hence, if you don't intend to go to college after graduating from high school, you should explore the clerical and sales occupations, the service occupations, or the manual and mechanical occupations.

OCCUPATIONAL FACTORS TO BE CONSIDERED

Some factors which you should consider before selecting an occu-pation as a career are:

1. Earnings — How much can one earn to start, and what is the maximum income that can be expected? Is the income steady or seasonal? Are unions and union dues involved?

2. Fringe Benefits — Many large companies help to finance further education and pay the major portion of the following benefits: sickness and medical expenses, paid vacations, a number of paid holidays, and a retirement plan.

3. Education and training required, entrance prerequisites, chances for advancement, length of apprenticeship if one is involved, future demand for the occupation; can it lead to other occupations? Is a license required?

4. Personal qualifications required such as age, height, weight, strength, and other physical traits listed in unit six, and the personality characteristics listed in unit seven of this manual.

5. Job Description — What is the job like? Is it performed outdoors or indoors? Are the surroundings bright and cheerful or dull, dirty, and dreary? Does the job involve travel? What are the risks involved? Does one have to purchase tools and equipment?

Earnings are placed first in the above list because they usually play a major role in determining whether a job is acceptable or not. Since the wages paid for a given job are so important, you should know how wage scales are established.

JOB AND SALARY RATING PLAN

Most industrial plants employing more than fifty people have some type of job and salary rating plan which establishes wage levels for each job. One of the most practical and widely-used job rating

plans was developed by the National Metal Trades Assocation. This plan is generally accepted as a fair and square method of measuring the value of jobs in the plant. It is called the point system because the total number of points which each job scores shows its relative standing in comparison to other jobs in the plant. Each job is analyzed by a job rating expert, and a job description together with specifications is written up for the job. The wage is then established by a point value system which assigns a given number of points to each of the eleven factors listed below:

1. Education — How much technical education, trade knowledge or training is required to perform the job satisfactorily? The more education and trade knowledge required, the higher the score.

2. Experience — How long does it take an individual with the specified education and trade knowledge to learn to perform the work satisfactorily? The longer it takes, the higher the score.

3. Initiative and Ingenuity — How much independent action and exercise of judgment in making decisions does the job require? The more of these elements required, the higher the score.

4. Physical Demand — How much physical effort is required? How continuous is it? The more of these requirements, the higher the score.

5. Mental or Visual Demand — How much mental and visual concentration is required? Must mind and eye be on the job every minute? The more continuous and concentrated the demand, the higher the score.

6. Supervision Received — Does the supervisor outline the methods and supervise the job closely? The closer the supervision, the lower the score.

7. What is the probability for and the possible effect of errors? The more opportunity for, and effect of errors, the higher the score.

8. Contacts with Others — How much responsibility for meeting, dealing with, or influencing other persons goes with the job? The more such responsibility, the higher the score.

9. Confidential Data — How much integrity and discretion is required in safeguarding confidential data? The more trust required, the higher the score.

10. Character of Supervision — What kind of supervisory responsibility is involved? How much accountability for costs, methods, and results goes with the job? The more responsibility, the higher the score.

11. Scope of Supervision — How many people are supervised? The more people, the higher the score.

When the number of points has been determined for each factor, the points are totalled. The job grade is then established by looking at tables which list the point score range and the corresponding grade. The final step in job evaluation is to establish what an employee in the highest graded job and one in the lowest graded job should be paid. This is determined by the accepted wage scale in the area where the plant is located. In other words, what other companies in the community are paying for similar work. Wage surveys are conducted by the wage administrator to determine the prevailing wages for the community.

SUMMARY

Wage levels are established on the basis of the degree of education and experience required for the job, the initiative, ingenuity, physical and mental demand of the job; working conditions and hazards involved, and the amount of responsibility for materials, well-being, and safety of others.

To get a good picture of an occupation, you should consider earnings, fringe benefits, education and training required, and the nature of the job. With this information about occupations and the knowledge about self derived from unit seven, you should be able to make a realistic career choice — match your aptitudes, interests, and abilities with the requirements of the job.

REVIEW

1. List six of the eleven factors used in rating jobs.
2. Explain how the point value system is used for job rating.
3. Give four or more factors which you should consider in making a career choice.
4. Make a tentative career choice showing how aptitudes, interests, and abilities should be matched to the requirements of the job.

Unit 9 Classification of Occupations

OBJECTIVES

After completing this unit, you should be able to analyze and classify occupations. To demonstrate this ability you will:

1. Name five of the nine classifications used in the *Dictionary of Occupational Titles* (DOT).
2. Explain what is meant by families of occupations.
3. Name four occupations which are closely related and four which are not.
4. Explain how the nine DOT classifications may be reduced to five.
5. Give four examples of service occupations together with their educational requirements.
6. List four examples of skilled and four examples of semi-skilled manual and mechanical occupations.

THE NINE DOT CLASSIFICATIONS:

To select a vocational goal best suited to your interests and abilities, you have to study occupations so you can learn their requirements. But with more than 2000 different jobs in the United States, it is virtually impossible to study all of them. To make the task easier, the *Dictionary of Occupational Titles*, (DOT) divides the occupations into nine classifications which are related according to activities involved as follows:[11]

1. Professional, Technical, and Managerial Occupations
2. Clerical and Sales Occupations
3. Service Occupations
4. Farming, Fishery, Forestry, and related Occupations
5. Processing Occupations
6. Machine Trades Occupations
7. Bench Work Occupations
8. Structural Work Occupations
9. Miscellaneous Occupations

Thus, by classifying over 2000 occupations into nine related groups, the DOT makes the study of occupations much easier.

There are other systems by which occupations can be grouped or classified.[12] Since the DOT is widely used throughout the country by state employment agencies as well as private employment agencies, you should learn how to use it. Furthermore, you are going to use the DOT to study occupations.

The letters DOT stand for DICTIONARY of OCCUPATIONAL TITLES. The DOT is similar to the dictionary of the English language in that it contains definitions of words. However, the DOT definitions are confined to names or titles of occupations. For this reason, it is called the *Dictionary of Occupational Titles*. Moreover, the DOT also contains code numbers to be sure that occupations with similar names are not confused with each other.

To find the definition or description of a particular occupation in the DOT, you must have the code number. The fourth and latest edition of the DOT lists the occupational descriptions by code numbers beginning with the lowest number, 001.061-010, on page 15, and ending with the highest number, 979.687-022, on page 946. If you don't have the code number, you must look it up in the alphabetical index of the DOT where all occupations are listed alphabetically. (See pp. 965-1156 of DOT).

In learning to classify occupations, you will learn the relationship which exists between them. Many occupations are closely related like brothers and sisters, while others are more distantly related like second or third cousins. Physicians, dentists, and physical therapists are examples of close relationships. They all work with people; they are all employed in the health professions; they all require a college degree or higher plus state licensing through examinations. Since the occupations that are closely related have similar requirements, the study of careers is made easier when we classify them under similar groups.

DOT CLASSIFICATION SIMPLIFIED

To make the study of occupations easier, the DOT classification may be simplified by putting categories five to nine into one all-inclusive group called "Manual and Mechanical Occupations". This action is justified because, though the occupations in groups five to

eight are in the manufacturing and construction fields, most of them involve the manual and mechanical occupations. Similarly, although the careers in group nine are in the fields of transportation and communication, most of them involve manual and mechanical occupations.

ANALYSIS OF THE FIVE CLASSIFICATIONS

The nine families of occupations included in the DOT are now reduced to five classifications. Examples of occupations in each of the five groups are given below under subheading (1); educational requirements are given under (2). To find requirements for any other occupation use the Alphabetical Index in the back of the *Occupational Outlook Handbook*.[13]

1. Professional, Technical, and Managerial Occupations
   a. Professional
      (1) Examples: Physicians, Dentists, Lawyers, Engineers, Scientists, Counselors, and Teachers.
      (2) Educational Requirements: College degree or higher.
   b. Technical
      (1) Examples: Draftsmen, Photographers, Television Repairmen.
      (2) Educational Requirements: High School Diploma or higher.
   c. Managerial
      (1) Examples: Sales Managers, Buyers, Office Managers.
      (2) Educational Requirements:
      Sales Managers or Buyers — College degree
      Office Managers — High School diploma or higher

2. Clerical and Sales Occupations
   a. Clerical
      (1) Examples: File Clerk, Typist, Stenographer.
      (2) Educational Requirements: High School diploma or higher.
   b. Sales — Involve selling many different products
      (1) Examples: Drug salesman, Sales Clerk in retail store, Instrument salesman.
      (2) Educational Requirements: High School diploma for Sales Clerk, College degree for others.

3. Service Occupations
   a. Examples: Bartenders, barbers, cooks and chefs, cosmotologists, firemen, mail carriers, practical nurses, policemen, waiters, and waitresses, and airline stewardesses.
   b. Educational Requirements: High School Diploma or higher.

4. Farming, Fishery, Forestry, and Related Occupations
   a. Farming
      (1) Examples: Farm hand, farm machinery set-up man, farm mechanic.
      (2) Educational Requirements: High School diploma preferred by most employers.
   b. Fishery
      (1) Examples: Fisherman—clam, eel, lobster or mussel.
      (2) Qualifications: Noneducational, some experience preferred.
   c. Forestry
      (1) Examples: Forester, hunting, trapping and related occupations.
      (2) Educational Requirements: A college degree is required for a forester; qualifications for related occupations are based on experience.

5. Manual and Mechanical Occupations
   a. Skilled: Best examples are the apprenticeable crafts or trades[14] such as automotive mechanics, carpenters, cabinet makers, draftsmen, jewelers, machinists, sheet-metal workers, and tool-and-die makers.
   b. Semiskilled: Examples are machine tool operators such as engine lathe operator, milling machine operator, drill press operator, and automatic screw-machine operator.
   c. Unskilled: Examples are construction laborers, farm laborers, janitors, and garbage or trash collectors.
   d. Educational requirements
      (1) A high school diploma is required for skilled trades and preferred by most employers for semiskilled occupations.
      (2) No educational requirements have been established for the unskilled occupations.

REVIEW

1. Name five of the nine classifications used in the *Dictionary of Occuptional Titles (DOT)*.
2. Explain what is meant by families of occupations and give some examples.
3. Name four occupations which are closely related and four which are not.
4. Explain how the nine DOT classifications may be reduced to five. What classifications are included in group five?
5. Define manual and mechanical occupations.
6. List four examples of skilled and four examples of semi-skilled occupations.
7. Give five examples of service occupations together with their educational requirements.

Unit 10 Analyzing an Occupation

OBJECTIVE

After completing this unit, you should be able to:

- Use the *Occupational Outlook Handbook — OOH —* to find occupational information.
- Name four different types of occupational information which may be found in the *OOH*.
- Analyze an occupation by completing the outline in this unit.

TYPES of INFORMATION CONTAINED in the OOH

1. Nature of the Work
2. Places of Employment
3. Training, Other Qualifications, and Advancement
4. Employment Outlook
5. Earnings and Working Conditions
6. Sources of Additional Information

For a better understanding of each of the above headings, a brief excerpt from the *OOH* for the machinist occupation is given below.

Nature of Work: All-around machinists are skilled metal workers who can perform a wide variety of machining operations. They are able to set up and operate most types of machine tools used to make metal parts....

Places of Employment.... Although machinists work in all parts of the country, jobs are most plentiful in areas where many factories are located....

Training, Other Qualifications, and Advancement: A four year formal apprenticeship is the best way to learn the machinist trade....

Persons interested in becoming machinists should be mechanically inclined and temperamentally suited to do highly accurate work....

A high school or vocational school education, including mathematics and physics is desirable....

All-around machinists have numerous opportunities for advancement....

Employment Outlook: The number of all-around machinists is expected to increase through the mid-1980's....Much of the employment growth will occur in the maintenance shops of manufacturing plants....

Earnings and Working Conditions....Machinists employed in metropolitan areas had estimated average hourly earnings of $6.76 in 1976.

Machinists are members of unions. They must follow strict safety regulations....Most shops are clean and well ventilated....

Sources of Additional Information:

The National Machine Tool Builders Association
International Association of Machinists and Aerospace Workers
Others

For more substantial information on a particular occupation, see the *OOH*. You should become familiar with the use of the Handbook while studying careers. To locate a given occupation in the *OOH*, turn to the alphabetical "Index to Occupations and Industries". In the latest, 1978-1979 Edition of the *OOH*, the alphabetical index is located on pages 800-818.

The Occupational Outlook Handbook is published by the U.S. Department of Labor. It is revised every other year: the latest edition is dated 1978-1979. The next edition will be published in 1980 and dated 1980-1981. Quarterly publications of the Handbook are published four times a year, and may be purchased from the Superintendent of Documents, U.S. Government Printing Office.

REVIEW

1. Name four different types of information which may be found in the *OOH*.
2. Analyze an occupation by completing the Outline for Analyzing an Occupation on the following pages. Use the *OOH* as one source of information.

Outline for Analyzing an Occupation

After completing this unit, you should be able to analyze any occupation in regards to the following elements:

Date _____ Student's Name _____

Classification or job family group (Seiect 1 of the 5 groups listed on pp.

A. General _____

B. Specific Branch _____

C. Name of particular job _____

Nature of work — Describe occupation by listing at least five activities

A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

Physical Requirements or Demands

A. Stature: Minimum Height _____ Weight _____

B. Strength for lifting, carrying, pushing, or pulling

_____

_____

C. Climbing and Balancing (ladders, stairs, scaffolds)

_____

_____

D. Stooping, Kneeling, Crouching _____

_____

E. Talking, Hearing _____

_____

Personality Traits, Interests and Aptitudes required for the job

A. _____ F. _____

B. _____ G. _____

C. _____ H. _____

D. _____ I. _____

E. _____ J. _____

Education or Training Required

A. What skills do you need?

1. _____ 3. _____

2. _____ 4. _____

B. What courses in high school, technical school, or community college would help to prepare you for this job?

_____ _____

_____ _____

_____ _____

_____ _____

C. Where can you get the training needed?

_____ _____

_____ _____

Demand for workers in this job

A. Are additional workers needed now in this occupation?

Yes _____ No _____

B. Will still more workers be needed in the future?

Yes _____ No _____

Promotion

A. Are there opportunities for promotion?

B. What are the steps of promotion?

_____ _____

_____ _____

C. Is additional training needed to qualify for promotion?

Yes ____ No ____ Formal ____ Informal ____ Apprenticeship ____

D. Are there related occupations to which this job may lead?

Yes _____ No _____

Earnings

A. Beginning wage (underline one: per hour, per day, per week) $_____

B. Wage earned by most workers $_____

C. Highest wage $_____

D. Fringe Benefits _____

_____

_____

Hours of Work

A. Daily _____ B. Weekly _____

C. Is there additional pay for overtime work? Yes _____ No _____

D. Are there seasonal layoffs? Yes _____ No _____

Health and Safety

A. Name dangers involved _____

_____

_____

B. Is there a high accident rate on this job? Yes _____ No _____

C. What safety precautions must be taken?

1. Wear protective goggles? Yes _____ No _____
2. Wear protective clothing? Yes _____ No _____
3. Wear safety shoes? Yes _____ No _____

Employee Organizations

A. Would you be expected to join a union? Yes _____ No _____

B. Would you be expected to join an employee organization?
Yes _____ No _____

Service to the community — How do workers in this job serve the community?

A. _____ D. _____

B. _____ E. _____

C. _____ F. _____

Firms in your town or country where this type of work would be available.

A. _____ D. _____

B. _____ E. _____

C. _____ F. _____

Sources of information used to make this study. (List three or more)

A. _____ C. _____

B. _____ D. _____

Indicate your interest for this occupation

A. High _____ Medium _____ Low _____

Unit 11 Matching Your Characteristics to Career Requirements

OBJECTIVES

After completing this unit, you should be able to:

- State Hoppock's theory of occupational choice.
- Explain what is meant by sampling of an occupation.
- Define strengths and weaknesses.
- State job requirements for two occupations of your choice.
- Match these job requirements with your qualifications.

OCCUPATIONAL CHOICE

Occupational choice begins in early childhood when children first become aware that an occupation can help to meet their needs. As they learn more about different occupations, children realize that some of these provide experiences which are satisfying, while others offer displeasing and frustrating experiences. Thus, children get positive and negative feedback as they explore various occupations. As children grow older, job exploration becomes more earnest and realistic. According to Hoppock's theory of occupational choice, occupations are chosen to meet needs.[15] The occupation that one chooses is the one that he believes will best meet his needs. These needs may be perceived and understood, or they may be vaguely felt as attractions which draw the student in certain directions.

STRENGTHS AND WEAKNESSES

Information about self and about occupations is the foundation of a successful career. You should capitalize on your strengths, not your weaknesses in selecting a career. What are strengths and weaknesses? Strengths are a person's good points, such as intense interest and motivation, a high degree of ability, courage, perseverance, physical strength — if required by the job — good vision, emotional stability, and good work habits. Weaknesses are a person's bad points, such as lack of any of the above traits, poor work tolerance, short attention span, or having undesirable characteristics such as drug addiction, drunkenness, or criminal tendencies. Each occupa-

tion has definite requirements or qualifications which a person must have to be able to do the job. Lack of any of these requirements can be considered a weakness as far as that occupation is concerned. Thus, self-information will help you recognize your strengths and weaknesses and anticipate success or failure in a contemplated occupation; occupational information will help you discover the vocations which meet your needs.

MATCHING PERSONAL QUALIFICATIONS TO JOB REQUIREMENTS

To make a wise vocational choice, you should match your personal qualifications to the requirements of the job you are considering. The matching may be done mentally at first, by thinking about your qualifications and comparing them with the job requirements — If you are considering a trade like machinist or toolmaker, you must have good mechanical aptitude and like to work with tools and machines. If you are considering bookkeeping, you must like to work with figures and have good numerical ability. If you are considering art work, you must have good color discrimination and be creative. If you are considering a profession, you must have good scholastic ability and like school work.

After matching your qualifications with job requirements through mental trial and error, you are ready to sample the occupation by trying out the work involved in your tentative career. You can do this either in the school shop or in the industrial community. You must simulate actual job conditions as closely as possible by using the tools and materials of the trade, whatever they are. While sampling the job, ask yourself questions like the following: Do I like to do that kind of work? Can I do it without much difficulty? Does it satisfy me or fill a need? If you can answer yes to these questions, you are getting positive feedback. Continue to explore the same occupation to be sure you can fulfill all the requirements of the career you are sampling. However, if you get negative feedback, you should sample another occupation.

KNOWLEDGE ABOUT SELF

While working on unit five you should become thoroughly familiar with your interests and aptitudes. Perhaps you will discover

new interests and aptitudes as you perform the exercises in this unit. You should also review with your guidance counselor the results of interest inventories and aptitude tests you have taken. Are your interests and abilities suited to the occupation of your choice? Can you acquire the skills and knowledges required by the occupation you have chosen?

Unit six deals with physical and cultural traits as they relate to careers. While working on this unit you should become thoroughly familiar with your physical traits, such as height, weight, eyesight, level of energy, and strength. You should also analyze your attitudes toward people with different cultural backgrounds, and try to relate both your physical traits and cultural attitudes to job requirements.

Unit seven, Personality Characteristics, contains a rating scale for personality traits including interests, values, and your work habits. As you work on this unit, you will learn about the various elements that make up personality and get a better understanding of your own personality. By using the rating scale you can rate yourself on traits like diligence, dependability, pride in a job well done, and punctuality — traits which employers value — as well as many other traits which make up personality.

KNOWLEDGE ABOUT OCCUPATIONS

As you work on units eight to twelve, you will learn much about occupations and occupational requirements. In unit twelve you will learn about the composition of U.S. Industry, the occupational outlook, and future industrial trends. In unit nine you will learn how the *Dictionary of Occupational Titles* (DOT) classifies occupations into nine groups, how these nine groups are reduced to five, and what the educational qualifications are for each of the five groups. In unit eight you will learn how the study of occupations affects career planning, and in unit ten how to make a detailed analysis of an occupation.

While learning about self and about occupations, you have been sampling occupations of your choice in the school shop. By the end of the school year, you will be ready to select the career which is best suited to your needs. At this point, you should discuss your choice with your industrial arts teacher and with your guidance

counselor. If they confirm your choice, you can plan the vocational training required to make your career choice a reality.

SUMMARY

Occupational choice begins in early childhood and becomes more realistic and earnest as you grow older. Hoppock suggests that when a person has the opportunity to choose a career, he selects the occupation which will best meet his needs. In selecting a career, you should capitalize on your strengths, but to do this, you must know yourself well, and you must know the available occupations well. Then you can match your qualifications to the requirements of the career you select. Occupational sampling in the school shop is an important phase of career education because it permits you to use the tools of the trade. If the occupation you are sampling is well suited to you, you will get positive feedback. Before deciding on your life's career, you should discuss your choice with your industrial arts teacher and your guidance counselor.

REVIEW

1. State Hoppock's theory of occupational choice.
2. Explain what is meant by sampling of an occupation.
3. Define strengths and weaknesses.
4. State the job requirements for two occupations of your choice.
5. Match these job requirements with your qualifications.
6. Indicate your first and second choice for the two occupations listed above.

Unit 12 Occupational Outlook

OBJECTIVES

After studying this unit, you should be able to:

- Give the minimal educational requirements for entry level jobs.
- Understand the reasons — give three — for the higher educational requirements of today's careers.
- Define a white-collar worker.
- Define a blue-collar worker.
- State three advantages that a high school graduate has over the school drop-out.

COMPOSITION OF U.S. INDUSTRY

Industries may be either goods-producing or service-producing. Most of the Nation's workers are in industries or activities that produce services: health care, teaching, government service, transportation, insurance service, and banking. The production of goods — construction, manufacturing, mining, and farming — requires less than half of the country's work force.

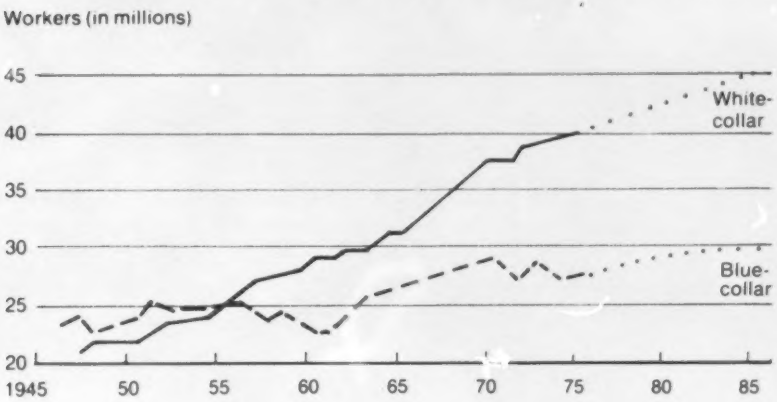
OCCUPATIONAL OUTLOOK

American industries are growing larger, more complex, and more mechanized. Occupations are also becoming more complex and more specialized. Consequently, the job seeker today needs more education than he ever did before. The minimal educational requirement for entry-level jobs is a high school diploma. Some employers are looking for employees who have graduated from a junior college or technical school to fill white-collar jobs.

A significant change in the Nation's occupational outlook has been a shift toward white-collar jobs. White-collar workers — doctors, lawyers, teachers, managers, nurses, salespeople, and office workers — outnumbered blue-collar workers for the first time in the Nation's history in 1956. (See graph on page 82.) The trend of rapid growth for the white-collar occupations is expected to continue, but a slower than average growth is anticipated for blue-collar

jobs. Blue-collar workers are laborers, machine operators, farm workers, service station operators, and craftsmen such as welders, machinists, electricians and carpenters.[16]

EMPLOYMENT HAS SHIFTED TOWARD WHITE-COLLAR OCCUPATIONS



Source: Bureau of Labor Statistics

FUTURE TREND

Automation is changing the nature of many occupations. Low-skilled and semi-skilled jobs are gradually disappearing. Millions of blue-collar jobs have been wiped out during the last decade. For example, a huge tomato harvester, Fig. 12.1 below, is in operation in California's Sacramento Valley with a capacity for picking 10 tons of

Fig. 12.1 — Courtesy of Blackwelders

tomatoes an hour. A seed planter is in operation at Seabrook Farms in New Jersey with a capacity for planting up to four row-miles of seed a day.[17] Numerically operated machines are slowly replacing the machine operators as automation supplants human manipulation with electronic control devices. One supervisor of an automatically controlled operating system may replace many machine operators. In the automated office, high-speed computers and data processing equipment are replacing bookkeepers, stenographers, and clerks.

The new technology has shifted the emphasis from manipulative power to brain power just as human muscle power was replaced by steam and electric power during the industrial revolution. Consequently, occupational opportunities are very limited for those who do not complete high school. Moreover, state laws limit the type of work one can do below a certain age. For example, young people under 18 years of age cannot be hired for any of the following jobs: motor vehicle driver or helper, coal miner or helper, operating elevators or hoisting apparatus, making explosives, operating saw mills, wood turning lathes, or any power-driven woodworking machine. Finally, a very important reason for staying in school is higher earning power. Studies of lifetime earnings indicate that high school graduates earn more than those who do not complete high school, and college graduates earn more than high school graduates.

REVIEW

1. State the minimal educational requirements for entry-level jobs.
2. Why do the careers of today have higher educational requirements?
3. Define the white-collar worker and give three examples.
4. Define the blue-collar worker and give three examples.
5. State three advantages that a high school graduate has over the dropout.

SECTION IV

Technology Yesterday, Today, and Tomorrow

Unit 13 Early Manufacturing Processes

OBJECTIVES

After completing this unit, you should be able to describe early manufacturing processes by:

1. Comparing division of labor with specialization.
2. Listing three or more of the inventions which brought about the industrial revolution.
3. Explaining how specialization increased the number of occupations.

Some understanding of how our modern technology developed will give you a better insight into the American industrial complex. It should also give you a better comprehension of how subdivision of labor or specialization led to the many occupations listed in the DOT.

THE DOMESTIC SYSTEM

Modern manufacturing processes developed slowly at first; early methods were very primitive. Workers made things by hand using simple tools at home, and sold the finished product to merchants. The family was the productive unit. Women and children worked hard weaving cloth, making garments, baking bread, and farming. Because everything was made at home, the method was known as the "domestic system".[18]

Courtesy of ILGWU

Under the domestic system, artisans and craftsmen owned their own tools. Merchants supplied the raw materials, bought the finished products and paid workers on the basis of the quantity produced and the market price of the article. The artisan practiced division of labor; that is, a shoemaker made a complete pair of shoes, a tailor made the whole suit, and a cabinet maker made every piece of furniture himself from beginning to end. Hand tools were used, and specialization as we know it today was not practiced. Because production was very slow, the supply of goods could not keep up with the demand. Consequently, men began to invent machines to produce goods faster.

THE INDUSTRIAL REVOLUTION

New inventions brought about a rapid change in the method by which goods were produced. Since the change altered the lives of so many people, it became known as the industrial revolution. The industrial revolution abolished the domestic system by changing the place where goods were made from the home to the factory. It substituted machinery, on a large scale, for human and animal muscle.

Some of the principal inventions which brought about the industrial revolution are: the spinning jenny for spinning more than one thread at a time, Fig. 13.1, and the steam engine, Fig. 13.2, for

supplying the power to the machines. Other major inventions were: the power loom for weaving cloth, the cotton gin for separating cotton from seeds, the reaper for cutting grain at harvest time, the steam locomotive and the steamboat for improving transportation. Finally, the invention which brought about an improvement in all the other inventions was the Bessemer process of making steel. By making steel available in large quantities, the Bessemer process effected improvements in machine design and manufacturing.

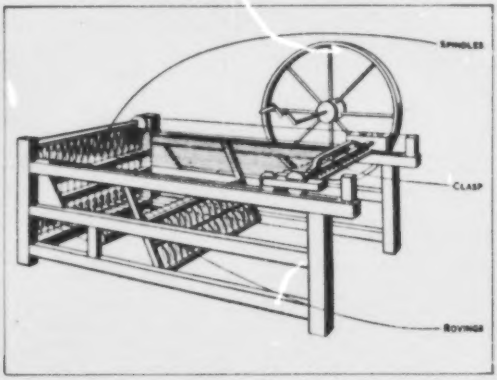


Fig. 13.1 The Spinning Jenny
Courtesy of the Science Museum

Hargreaves' Spinning Jenny, invented in 1764, which was the first attempt to spin several strands of yarn at once, and containing all the elements, except rollers, of the modern spinning mule, but operated by hand

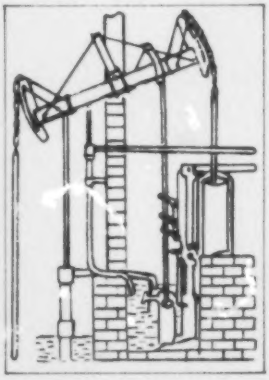


Fig. 13.2 The Watt Steam Engine

The Bessemer converter which is used in the Bessemer process is shown at left. Molten pig iron is poured into the converter and purified by forcing a stream of air through the molten metal as illustrated in Fig. 13.3. The impurities: carbon, silicon, and manganese are removed by oxidation.

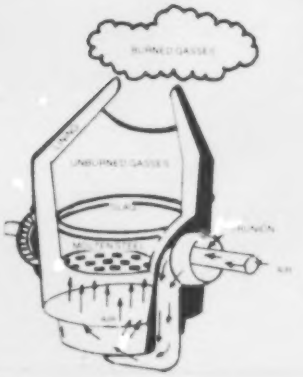


Fig. 13.3 The Bessemer Converter

As mentioned before, a machine is usually designed for a special purpose, such as the spinning machine for spinning cotton or the power loom for weaving cloth. Consequently, the invention of machines brought about specialization in the various manufacturing operations. A suit was no longer made by one man, but by many people — one person made pockets, another made collars, another made sleeves, and so on. By reducing the number of operations that each worker was required to do, specialization increased production by increasing the efficiency of the worker in his narrow field. However, the number of occupations required to meet the needs of industry increased tremendously as a result of specialization.

SUMMARY

Early manufacturing processes were very primitive. Products were made at home using simple tools. Because the family was the productive unit, this type of manufacturing became known as the "domestic system". Division of labor was practiced, whereby the tailor made the whole suit, and the shoemaker made the complete pair of shoes. Specialization as we know it today was unknown in the early days of the domestic system.

Because the supply of goods could not keep up with the demand, men began inventing machines to increase production. Improved production methods through specialization were also introduced. The rapid change in production and manufacturing methods became known as the industrial revolution.

REVIEW

1. Compare division of labor with specialization.
2. List three or more inventions which brought about the industrial revolution.
3. Explain how specialization increased production.
4. How did specialization increase the number of occupations?

Unit 14 Mass Production

OBJECTIVES

After completing this unit, you should demonstrate sufficient under-standing of production analysis and mass production to:

1. Define mass production.
2. Explain what is involved in "motion and time study".
3. Define productivity.
4. Make a flow process chart involving a product manufactured in the school shop.

DEFINITION

Mass production is large scale manufacturing of goods involving the systematic organization of human beings, machines, and materials to perform a common task, such as the building of an automobile. As new machines were invented, and the work center changed from the home to the factory, new manufacturing methods were introduced. The search for new methods to increase productivity and lower the cost of the finished product led to mass production. Under the principle of mass production, no one person alone turns out the finished product; rather the finished product is turned out by the plant as a collective effort. In their search for ways to improve methods, increase production, and reduce costs; plant owners hired "efficiency experts" who later became known as industrial engineers.

The elements of mass production are: work simplification, division of labor, automatic conveyance of work to and from workers, or to and from machines, and interchangeability of parts. Each of these elements is briefly discussed below. The student who is interested in industrial engineering can study each of these elements in depth.

WORK SIMPLIFICATION

Work simplification means improving methods of doing work by finding a better way. It is the principal element of mass production. It changes complex operations to simple operations by:

1. Eliminating waste motions and unnecessary operations.
2. Combining operations whenever possible.
3. Changing the sequence of operations.
4. Simplifying by finding a better way.

The industrial engineer analyzes the basic motions involved in performing various job operations and records the time required for each operation. He tries to reduce the time required to perform a given task by eliminating waste motion and by reducing the amount of effort required. He may simplify a job by omitting unnecessary lifting or by combining two operations into one.

Improving methods enables us:

1. To do better work
2. With less effort
3. In less time
4. At a lower cost

Work methods can almost always be improved as follows:

1. Select the job to be improved — Look for waste of time or materials.
2. Break it down in detail by making a flow process chart (see p. 101).
3. Develop a better method by questioning each operation. Can it be eliminated by changing the sequence of operations? Can it be combined with another operation?
4. Apply the better method

DIVISION OF LABOR

Division of labor is another element of mass production. It involves a great deal of specialization. As machines and tools are adapted to assembly lines, an endless number of simple jobs are created. Each task is sub-divided into smaller tasks by the methods engineer. The reason for job analysis and the continual breaking down of jobs is to make each job very easy so it can be done by a machine, or it can be learned quickly by the worker. Thus, high productivity can be achieved in a very short time. This numerous subdivision of labor accounts for the ever increasing number of job titles. For example, the third edition of the *Dictionary of Occupational Titles*, published in 1965, defines a total of 35,550 jobs.

This minute subdivision of labor has been criticized by many sociologists. They claim that this type of specialization reduces the worker to a mere adjunct of the machine — a cog in the wheel, so to speak. According to these critics, highly repetitive work stagnates the mind and makes the worker dull. Such criticism is countered by the boast that increased production makes more goods available to more people, and that workers do not really mind repetitious jobs. In selecting a career, you must decide for yourself whether you like repetitive work or not, and the effect it would have on you.

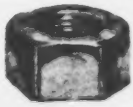
INTERCHANGEABILITY OF PARTS

Interchangeability of parts means that we can use one part in place of another. It is a very important element of mass production, for without it the automated assembly lines, which are the backbone of modern industry, would be impossible. As we shall see in Unit 16 — Automation — every component part of the automobile is manufactured separately, sometimes in different plants. After all the required parts are manufactured, they are sent to the assembly plant and assembled into the finished product. To make all these parts interchangeable, they are manufactured to specified tolerances. Tolerance means the total permitted variation. For a more detailed explanation of tolerance as well as interchangeable manufacture, see Quality Control, page 103.

Because of interchangeable manufacture, workmen in widely separated places can make mating parts that will fit together properly. Consequently, one can go to any autoparts store, and buy a part to repair his car with the assurance that it will fit in place of the old part. The same is true of parts for any of the appliances we have at home. In fact, there are very few parts manufactured today which are not interchangeable, thanks to Eli Whitney who introduced the principle of interchangeability. Some examples of interchangeable parts are given below.

Lock Nut

Wing Nut



Hex Nut

Tee Nut

Carriage Bolt & Nut | Round Hd. Screw | Flat Hd. Screw | Lock Washer

AUTOMATIC CONVEYANCE OF WORK

Automatic conveyance of work, another element of mass production, includes a large variety of ingenious devices such as mechanical arms and fingers, gravity feeds, vibrators, conveyor belts and trolleys, and many other inventions. Some machines employing these devices are shown below.

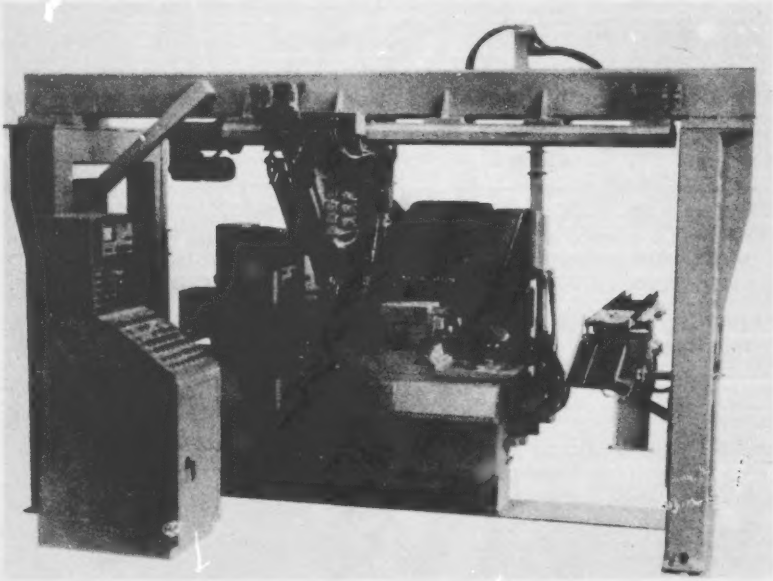


Fig. 14.4. Illustrates a centertype grinding machine equipped with a U-Frame, Double Arm Automatic Parts Loader. While one part is being ground, the loader moves to the right with a finished part and deposits it on the conveyer. The conveyer advances one position and the second loader arm picks up an unfinished part and moves back over the machine. As soon as the part being ground is finished, it is removed from between centers and the unfinished part is positioned for grinding. (Photo courtesy of Cincinnati Milacron.)

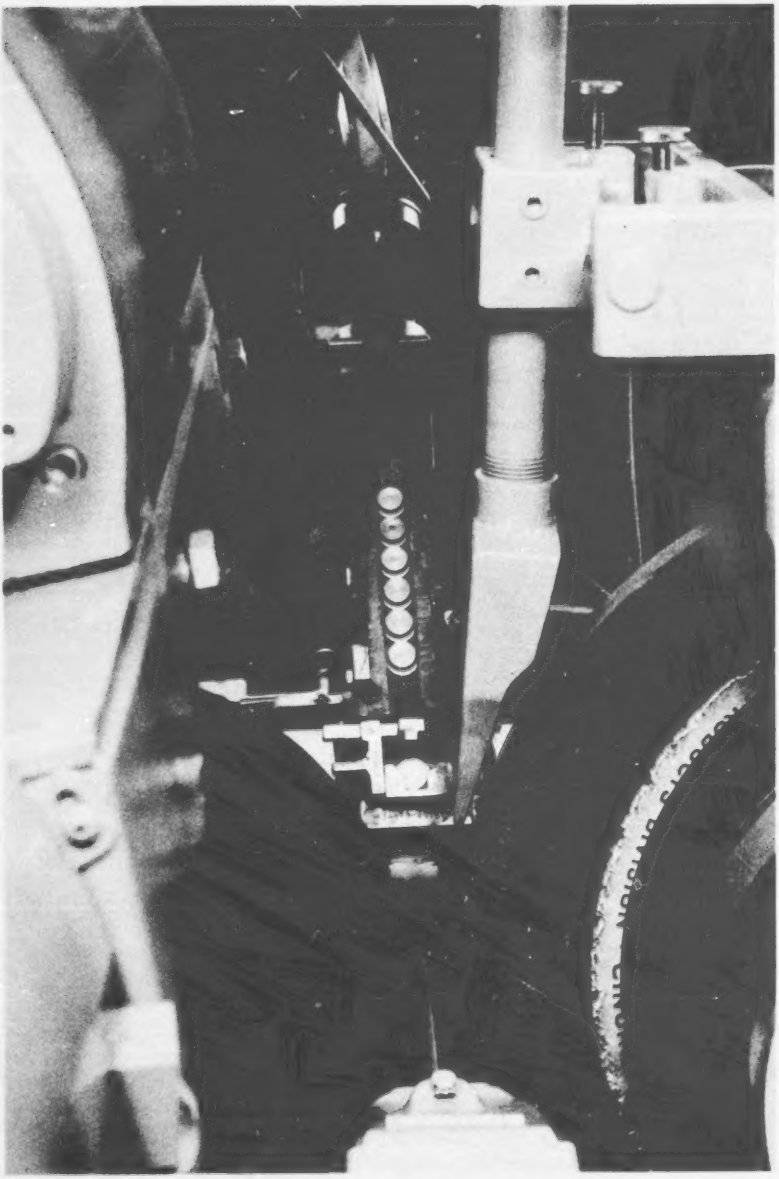


Fig. 14.5 shows a gravity fed parts loader for centerless grinding machines. The parts to be machined are prepositioned, placed between the grinding and regulating wheels, and ground to size. The finished part is dropped into a sloped chute which carries it away. (Courtesy of Cincinnati Milacron.)

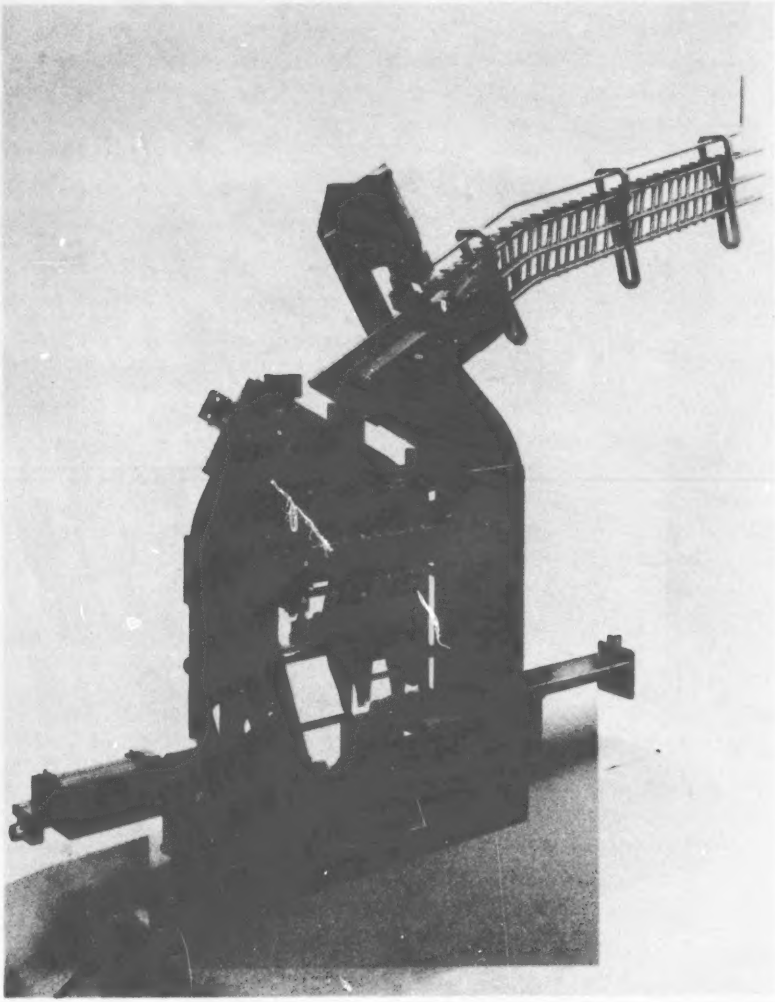


Fig. 14.6 illustrates another type of gravity fed parts loader and unloader. The parts to be ground (valve stems) are placed between the wheels by loading fingers. The finished parts are ejected into the chute at the right side of the fixture by means of a hydraulic piston. (Photo courtesy of Cincinnati Milacron.)

Fig. 14.7. Illustrates a vibration type small parts loader for thrufeed centerless grinding. These small bearing rollers are aligned and moved through the long tube to the grinding wheel. As the parts are finished to size they are unloaded at the back of the machine. (Courtesy of Cincinnati Milacron.)

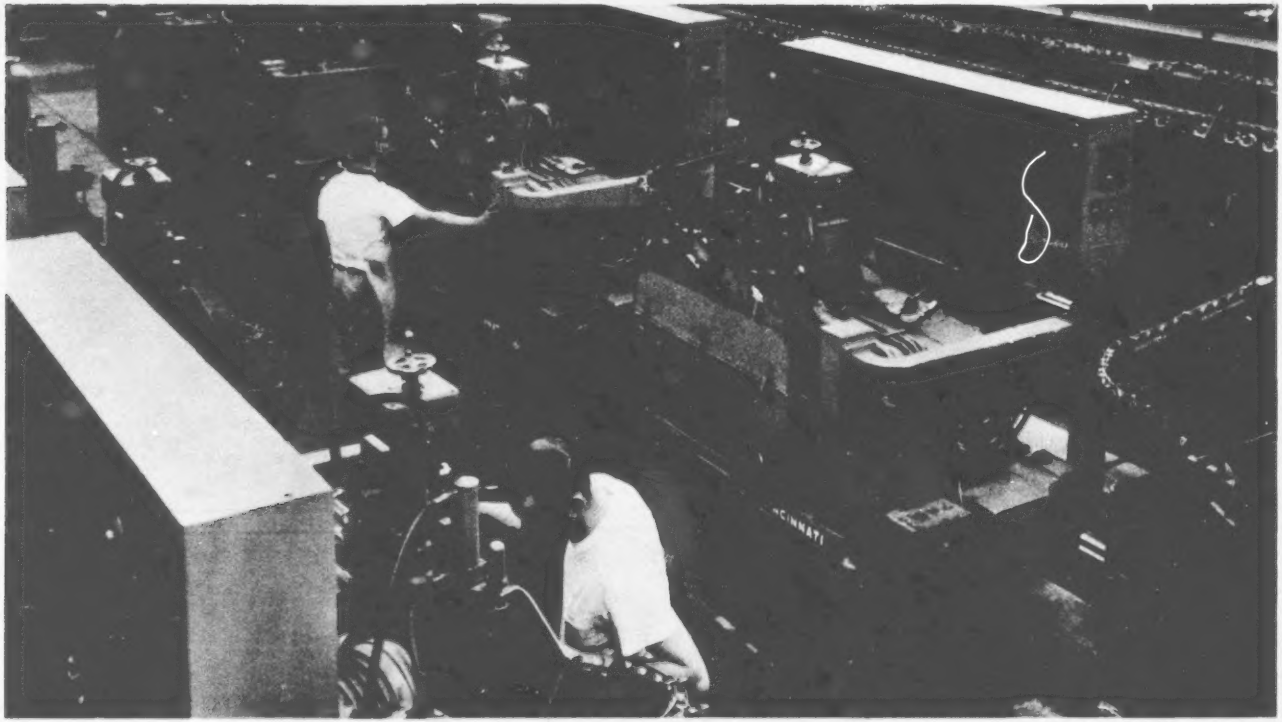


Fig. 14.8 Illustrates a complete bearing inner race grinding line with total parts conveyer system. Races are conveyed automatically to each machine, oriented, ground and carried away for inspection, cleaning, and assembly. (Photo courtesy of Cincinnati Milacron)

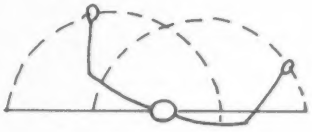
MOTION AND TIME STUDY

Motion and time study employs the principles of motion economy to do a job with the least amount of physical and mental effort. Some of these principles are listed and illustrated below.[19]

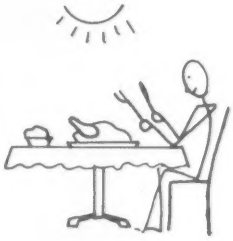
1. *Motions should be productive.* Hands should be used only for productive work — never to hold things which can be held in other ways.

2. *Motions should be rhythmic and smooth flowing.* Work methods should require hands to move in opposite and symmetrical directions.

3. *Motions should be simple.* Motions along curved rather than straight paths are preferred — avoid sudden change of direction; avoid zigzag motions.

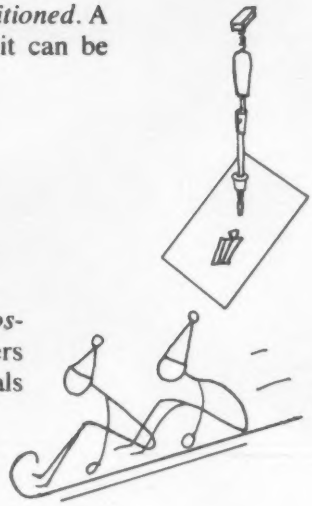


4. *Workers should be comfortable.* Chair, table heights, and the work should be placed and arranged so that the operator may work in comfort.



5. *Two or more tools should be combined whenever possible.* It is usually quicker to turn a small two-ended wrench than it is to lay it down and pick up another.

6. *Tools and materials should be prepositioned.* A holder should position the tool so it can be grasped the way it will be used.



7. *Gravity should be used wherever possible.* Gravity feed bins and containers should be used to deliver materials close to the point of use.

SCIENTIFIC MANAGEMENT

Frederick W. Taylor is known as the father of industrial engineering because he introduced the principle of scientific management in industry. He originated time study, introduced rest periods, and substituted selective hiring for random hiring. Selective hiring means employing the best qualified person for a particular job. In other words — Match the qualifications of a prospective employee to the requirements of the job. Industrial engineering deals with the development and application of cost and work standards to manufacturing operations.

Motion study, as we know it today, was developed by the Gilbreths, Frank and Lillian Gilbreth. Today industry has found that time study and motion study are inseparable. Hence, the term "time study" has been replaced by the term "motion and time study". Motion and time study is the analysis of methods, materials, tools and equipment used in performing a piece of work to find the most economical way of doing it. The "Flow Process Chart", shown on page 101, is used by the industrial engineer for production analysis. It was developed by Frank Gilbreth.

PRODUCTIVITY and the WORK ETHIC

Before moving on to an analysis of the Flow Process Chart, we must discuss productivity because, by affecting the cost of the products we buy, it affects our standard of living. It also affects the amount of unemployment in the country. What is productivity? It is the output per man hour of work or the number of pieces that a worker can produce in one hour. If John makes five dollars per hour and his productivity is ten finished pieces per hour, the production cost for each piece is 50 cents. But, if through improved manufacturing methods, John's productivity is increased to 20 pieces per hour, then the production cost for each piece is reduced to 25 cents. How does productivity affect unemployment? In order to compete with other nations on the international market for automobiles, for example, we have to be able to manufacture the automobile as cheap or cheaper than any of the other nations. If we cannot compete because of lower productivity and higher manufacturing costs, the other nations will sell more automobiles than we do. The result will be increased unemployment in our automobile industry.

The above discussion is intentionally simplified to give an example of the effects of productivity on free international trade. It is given without consideration for tariffs or import duties which may be used by any nation.

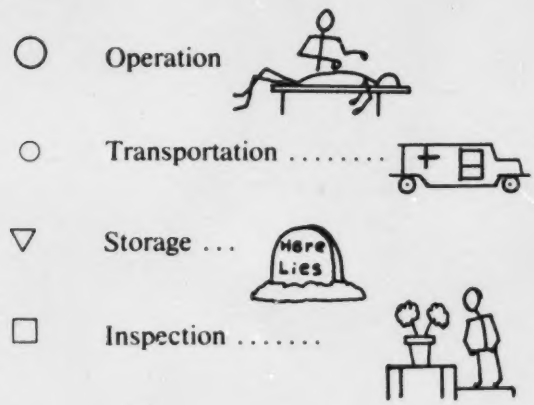
The work ethic maintains that work is necessary, desirable and good. It emphasizes quality of work, promptness, dependability and diligence as characteristics of the good worker. Because these characteristics promote productivity, employers value the work ethic. Violations of the work ethic, such as indifference to quality of work or poor work habits, will lead to discharge.

HOW TO MAKE A FLOW PROCESS CHART

1. Select the job to be studied. Choose a job that needs improvement most, A bottle-neck job requiring a large amount of time offers greater opportunities for improvement.

2. Observe the job to be studied by following it from beginning to end starting with the raw material and ending with the finished part.

3. Write a brief description of each detail, recording every operation, transportation, storage, and inspection.



4. Enter distance in feet for all transportations and the time required for each operation.

5. Summarize — Add up all the facts and put them in the summary block.

A careful study of the flow process chart, shown on page 101, by a trained person is almost certain to suggest improvements in the manufacturing process or ways to reduce production costs. These improvements may be effected by reducing the number of feet that the object or material is moved during the manufacturing process. Sometimes the machine performing the first operation is relocated near the material storeroom, or the final inspection station is relocated near the shipping room. Sometimes operations are combined, or unnecessary delays are eliminated. Thus, by eliminating waste motion, manufacturing methods are improved, productivity is increased, and production costs are reduced.

FLOW PROCESS CHART
FLOW OF WELDING UNIT THROUGH REPAIR SHOP

Travel-Ft.	*Time-Hrs.*	*Symbol*	*Description*
			Material received from customer
	.1	○	Unload
300	.2	○	Move to storeroom
	8.0	▽	Wait for paperwork
100	.08	○	Move to inspector
	1.50	□	Inspect for trouble
50	.06	○	Move to work station
	16.00	▽	Wait for trouble shooter
	2.16	○	Disassemble
200	.1	○	Move to storeroom
	120.00	▽	Await manufacture of new coil
100	.08	○	Move to bearing section
	9.65	○	Repair bearings
50	.04	○	Move to assembly group
	3.00	▽	Wait for assembler
	17.90	○	Assemble and adjust
30	.05	○	Move to test floor
	.50	○	Test
50	.04	○	Move to paint shop
	.50	○	Paint
100	.08	○	Move to shipping floor

SUMMARY			*Time in Hrs.*
No. of Operations	○	5	30.31
No. of Storages and Delays	▽	4	147.00
No. of Inspections	□	2	2.00
No. of Transportations	○	9	.73
Total Travel in Feet		980	

SUMMARY

Mass production is large scale manufacturing of goods involving systematic organization of people, tools, and machines to produce a better product cheaper. The elements of mass production are: work simplification, division of labor or specialization, interchangeability of parts, and automatic conveyance of work.

Work simplification means improving methods of doing work by finding a better way. The flow process chart is a map or an easy shorthand method to show how a job is being done. Careful study of the flow process chart usually suggests improvements in manufacturing methods to reduce costs.

Interchangeability of parts means that we can use one part in place of another. To make parts interchangeable, they must be manufactured to previously established standards of measurement known as "tolerances". Tolerance is the maximum deviation or error permitted in size, strength, surface finish or other requirements of a finished part.

REVIEW

1. Define mass production giving three or more examples of goods manufactured in this manner.
2. Define work simplification.
3. Explain "motion and time study".
4. Make a flow process chart involving a school shop product.
5. Define productivity.

Unit 15 Quality Control

OBJECTIVES

After completing this unit you should be able to:

1. Use steel rules, combination squares, and protractors to measure lengths and angles accurately.
2. Use inside and outside calipers to measure inside and outside diameters accurately. (to a tolerance of $\pm$ 1/64 of an inch)
3. Use drill gauges to measure drills of various sizes as well as cutting edge angles of drills.
4. Use a wire gauge to measure sheet metal of various thicknesses.
5. Use micrometer calipers to measure diameters of various sizes to a tolerance $\pm$ 0.001 inch.
6. Define the following terms: Quality control, interchangeable manufacture, tolerance.

QUALITY CONTROL

Quality control is the careful checking of each operation and of the finished part to make sure that it meets established blueprint tolerances and specifications. Quality control is one of the most important aspects of modern manufacturing. Without it we could not have interchangeable manufacturing or mass production.

To control quality we must first establish a tolerance or permissible deviation in the size of a part. (See Fig. 15.1) Then we must control work operations, by means of inspection, to stay within the established tolerance. This is done by measuring the parts while they are being manufactured and again after they are finished. Thus, we must control the entire manufacturing process: raw materials, manufacturing methods, parts and components, and the finished product.

Interchangeability of parts is made possible by interchangeable manufacture. INTERCHANGEABLE MANUFACTURE requires that production errors be contained within certain limits. It means manufacturing to specified tolerances. LIMITS are the maximum and minimum dimensions which define the tolerance zone, as shown on page 104.

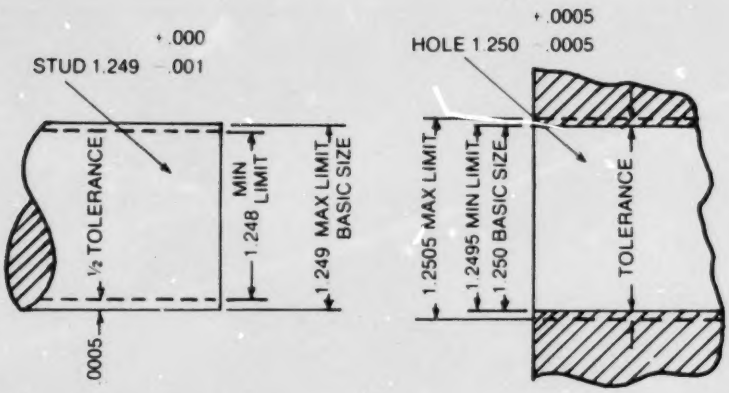


Fig. 15.1

TOLERANCE is the total permitted variation in the size of a part. It is twice the half tolerance shown in Fig. 15.1.

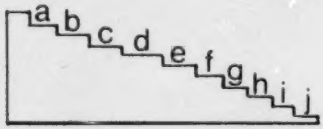
LIMITS and MANUFACTURING TOLERANCES are determined by the Engineering Department, but the Quality Control Department sees to it that these tolerances are maintained while the parts are manufactured. It is almost impossible to visit a manufacturing plant today without becoming aware of quality control.

QUALITY CONTROL recognizes that it is impossible to manufacture two things exactly alike. The efforts of Quality Control are directed toward controlling the degree of variability during the manufacturing process. No attempt is made to obtain perfection. If fact, Quality Control sets tolerances no closer than necessary because close tolerances increase manufacturing costs.

Many standard products such as copper, steel, or music wire, sheet steel, or screw threads have predetermined standards of accuracy. In other words, the tolerances for these products are set by the government, the Bureau of Standards, or another legal source.

TOOLS REQUIRED FOR SAMPLE INSPECTION PROBLEMS I-IV

1. One 6″ steel rule
2. One 12″ steel rule with English and metric graduations
3. One 6″ combination square
4. One 6″ inside calipers
5. One 6″ outside calipers
6. One drill point gauge
7. One drill gauge, fractional size
8. Six assorted drills, fractional size
9. One stepped gauge (made by a student)



10. One protractor
11. One brass piece (Made in shop)
12. One outside micrometer (1″)
13. One outside micrometer (2″)
14. One stepped measuring plug. Made in school shop.

15. One U.S. Standard Gauge for Sheet and Plate (iron and steel)
16. Twelve pieces of sheet metal of different thicknesses numbered 1 to 12.

SAMPLE INSPECTION PROBLEMS

Problem I

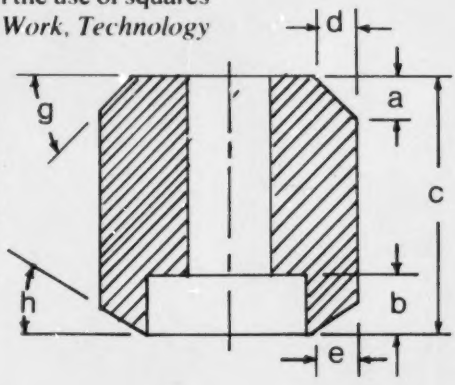
A. Study pages 108 and 109 — STEEL RULES and HOW ARE LENGTHS MEASURED? then measure lines 1-20 on problem sheet No. 1, shown on page 111, which you obtain from your instructor.

B. Measure steps a to j on the stepped gauge using the 6" steel rule; record answers on scratch paper as length a = _____, b = _____, etc. Be sure to put your name on all exercise sheets, problem sheets, and scratch papers.

Problem II

A. Study illustrations on the use of squares on pages 54 and 55 of *Metal Work, Technology and Practice*, 1962.

B. Copy sectional view of brass piece as shown at right. Measure dimensions a, b, c, d, and e on the brass piece using the 6" combination square and record answers on scratch paper.



Problem III

A. Measure the outside and inside diameters of the brass piece. Use the outside and inside calipers provided for these measurements and record answers on scratch paper.

B. Measure angles g and h on the brass piece using the protractor provided and record answers on scratch paper.

Problem IV

A. Measure the diameters of the six drills using the fractional size drill gauge. Record answers on scratch paper.

B. Measure the included angle of the same six fractional size drills using the "multi-point drill gauge". Record answers next to the diameters. (Ex. 15/64"-118°)

Problem V

A. Obtain a micrometer exercise sheet like the one illustrated on page 112 and insert the correct answers on the spaces provided. (Nos. 1-30)

B. Study page 109 INSPECTION METHODS, then measure diameters A-J on the stepped plug provided in tool kit. Use the 1 inch and 2 inch outside micrometers provided for this purpose; record answers on scratch paper.

Problem VI

A. Study table XXXIV on page 424 of *Metal Work: Technology and Practice*.

B. Measure the thickness of the 12 numbered pieces of sheet metal using the U.S. Standard Gauge for Sheet and Plate; record answers on scratch paper.

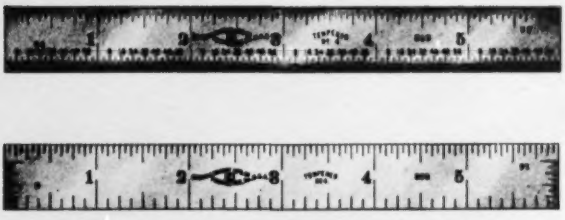
REVIEW

Answer the following questions on scratch paper after carefully reading about Quality Control on pages 103 and 104.

1. What is meant by Quality Control?
2. What is meant by "tolerance"?
3. How do we control the quality of manufactured products?
4. Why should tolerances be set no closer than necessary?
5. Explain why interchangeable manufacture would be impossible without quality control.

STEEL RULES

Steel rules are among the most useful tools in the machine shop. They are made in a variety of kinds as "flexible", "narrow", and "hook rules"; and in lengths from 1" to 48". The most popular of these rules is the 6" size shown below.



It will be observed in the above illustration that the graduation lines on the scale are of different lengths, the 64th lines are the shortest, the lines marking the 32nds, 16ths, 8ths, and so on are successively longer, the inch line being the longest. This is for the purpose of quickly reading the measurement.

When reading a scale measurement, find the nearest "significant" graduation, whether eighths, quarters, halves, or whole inches, and add or subtract, as the case may be, to obtain the fraction of the finer graduation. To illustrate:

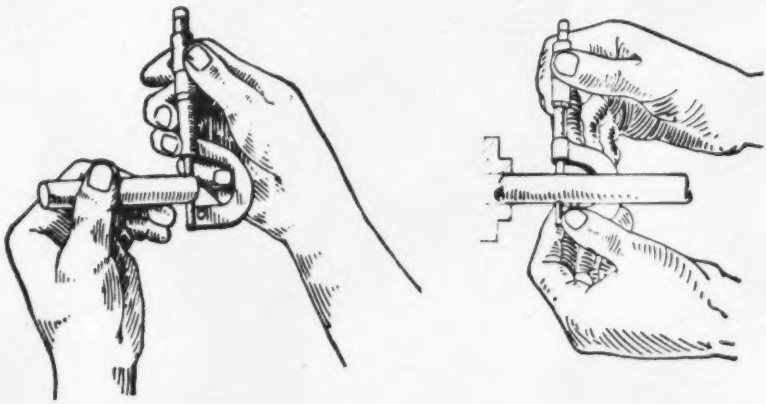
3-9/16" is 3-1/2" plus 1/16"
4-15/16" is 5" minus 1/16"
6-9/32" is 6-1/4" plus 1/32"

HOW ARE LENGTHS MEASURED?

For lengths which have a fractional tolerance (1/64 inch), a scale may be used. Try to read the scale within a few thousandths of exact length. Check the work drawing to be sure you are measuring from the correct points. Lengths which have a decimal tolerance closer than 1/64 inch should be measured with a comparator, micrometer, or another precision instrument.

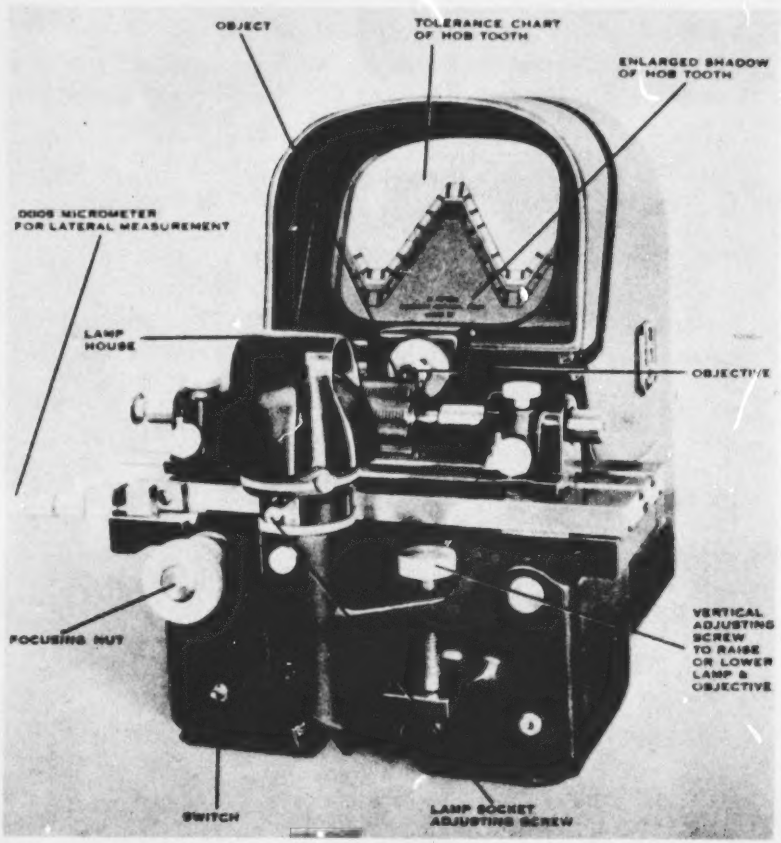
INSPECTION METHODS

1. HOW SHOULD DIAMETERS BE CHECKED?
   For close tolerances use a micrometer or a snap gauge. Never force micrometer or the gauge onto the work, but develop the feel of sliding either of these precision measuring instruments over the surface of the work. As shown below, the micrometer must make contact on both sides of the work, but it cannot be forced if



the measurement is to be accurate. To detect out-of-roundness, check two or more diameters about 90° apart. To detect taper, check both ends of a piece. Tolerances closer than .001 inch require some type of indicating gauge graduated in ten thousandths of an inch.

2. HOW SHOULD A RADIUS OR AN ANGLE BE CHECKED?
A good way to check a radius or an angle is on a comparator using the correct size chart as shown below. Work to the plus tolerance of a radius rather than the minus tolerance for safety reasons.



Checking Contour of a Hob Against a Master Chart
(Photo Courtesy of Jones & Lamson Machine Co.)

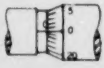
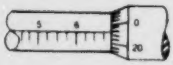
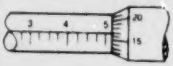
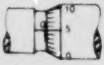
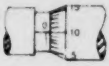
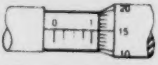
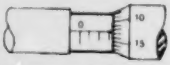
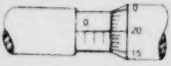
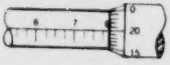
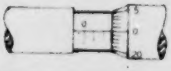
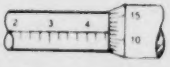
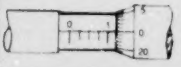
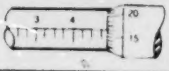
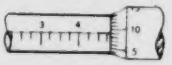
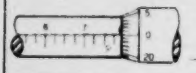
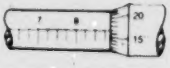
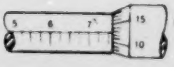
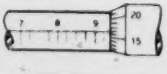
PROBLEM SHEET NO. 1 — USING A RULER

INSTRUCTIONS: Measure lines one to twenty below, and record answers in centimeters and millimeters. Be sure to use the first column for the English measurements and the second column for the metric measurements.

Name of student _____ Measurements: English Metric

1. _____ ____ ____
2. _____ ____ ____
3. _____ ____ ____
4. _____ ____ ____
5. _____ ____ ____
6. _____ ____ ____
7. _____ ____ ____
8. _____ ____ ____
9. _____ ____ ____
10. _____ ____ ____
11. _____ ____ ____
12. _____ ____ ____
13. _____ ____ ____
14. _____ ____ ____
15. _____ ____ ____
16. _____ ____ ____
17. _____ ____ ____
18. _____ ____ ____
19. _____ ____ ____
20. _____ ____ ____

Write the correct micrometer reading on the line after each sketch.

1  ____	11  ____	21  ____
2  ____	12 ____	22 ____
3  ____	13  ____	23  ____
4  ____	14  ____	24 ____
5  ____	15 ____	25  ____
6  ____	16 ____	26  ____
7 ____	17 ____	27 ____
8 ____	18  ____	28 ____
9  ____	19  ____	29 ____
10 ____	20  ____	30  ____

Drawn by: H. B. DiPaul

June 30, 1979

Unit 16 Automation — The Second Industrial Revolution

OBJECTIVES

After completing this unit, you should understand how automation affects the labor force, and be able to:

1. List the three levels of automation that engineers speak about.
2. Explain the function of a computer in a fully automated plant.
3. Name three or more intellectual tasks performed by a computer.
4. List two or more occupations which would be open to a machine operator who is replaced by a numerically controlled machine.

AUTOMATION DEFINED AND ILLUSTRATED

To the average person, automation is anything that works automatically. To engineers, automation means controlling manufacturing processes by means of self-operating equipment or electronic devices. A common example of automation is the use of machines to perform assembly-line operations which were once done by workers. For example, fourteen industrial robots capable of performing intricate welding operations are used at the General Motors Assembly Plant in Norwood, Ohio. (See Fig. 16.1, page 114.) These robots are grouped together with other machines, positioning devices, inspection gauges, hoists, conveyor belts, and especially trained people along a huge production line. Subassemblies such as frames, axles, steering components and engines are introduced at various points of the assembly line, and at the end of the line a completely assembled automobile emerges.

A visitor at the Norwood Plant can witness the assembly of the entire automobile. The body and chassis are assembled simultaneously but at different parts of the plant. Subassemblies are added progressively to both body and chassis as they move toward the point in the automated line where they converge. After the engine is installed in the chassis (Fig. 16.2) the body is lowered into it by an

overhead hoist (Fig. 16.3). Before leaving the plant, the car is given a road and roll test (Fig. 16.4) and a final inspection (Fig. 16.5).

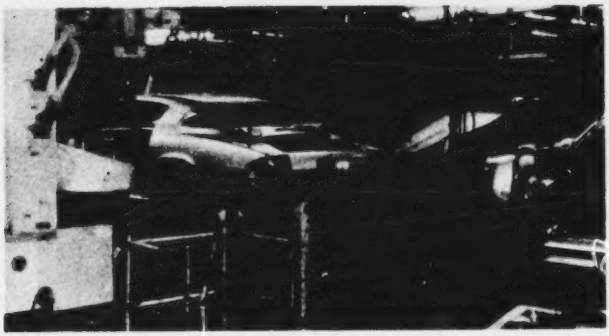


Fig. 16.1
The story of every gleaming new automobile being driven off the assembly line begins with the toepan, floor and rear compartment pans being joined in the spot welding machine. These parts are soon joined with the roof braces, hinge pillars and other parts. An interesting part of the welding process in our plant is the use of *"Unimates"*. These are five position industrial robots capable of performing intricate welding operations and doing it repeatedly within a tolerance of thousandths of an inch. They contribute greatly to the weld quality of the vehicles built here.

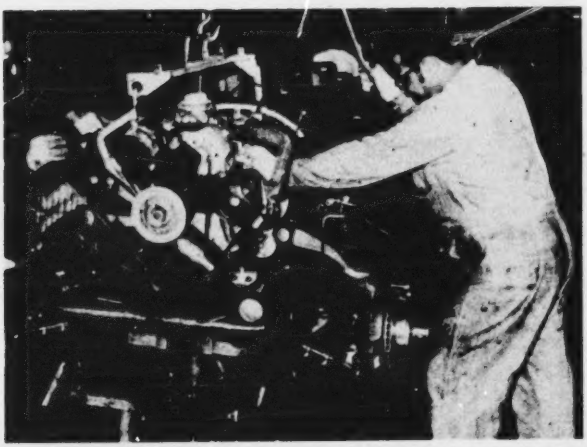


Fig. 16.2 Engine installation
The engine is then installed in the chassis following preparatory operations including equipping the engine with the transmission, filter, wiring, fuel pump, fans and fan belts.

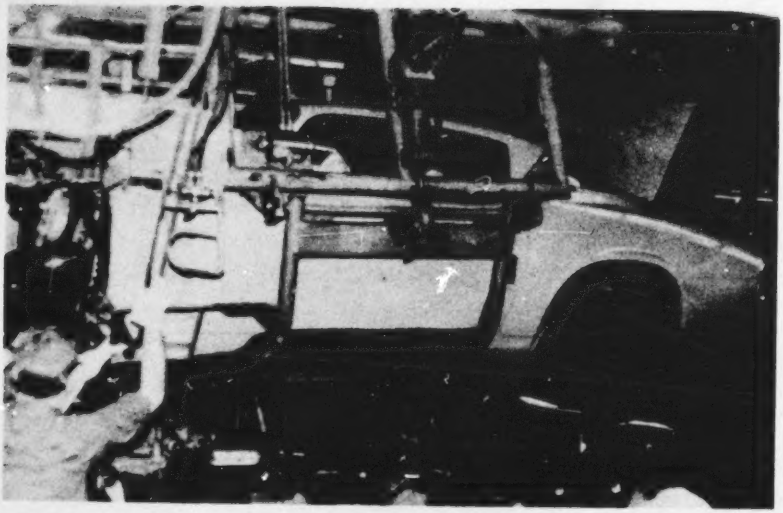


Fig. 16.3 Body Drop

One of the most interesting operations in the Norwood Plant is the body drop. Here the body is lowered by an overhead hoist to merge the body and the chassis into a single unit. This "*marriage*" is accomplished through an intricate system of scheduling efforts.

Fig. 16.4 Road and Roll Test

Before leaving the plant the car is driven onto a set of steel drums where it is "*driven*" and given a performance test for safety and quality. A floor vent to the rear of the car removes exhaust fumes from the plant. The car is then given a front wheel alignment and a brake test prior to being driven from the plant.

Fig 16.5 Final Inspection
As the car reaches the end of the assembly line, a final inspection is made. Although it has been inspected at various points through the entire system, the car is given a thorough re-check. After receiving a final "*O.K.*" to ship the unit is shipped to the dealer, either by rail or truck. The dealer's delivery to the customer brings an end to our story.

Automation supplants human manipulation with electronic devices, replacing a number of machine operators with one supervisor of the automatically controlled operating system. Automated machines can mine coal, pick cotton, sort checks, grade oranges, weave cloth, cast and finish engine blocks, and assemble a whole automobile by putting subassemblies together.

LEVELS OF AUTOMATION

Engineers speak of different levels of automation — low, medium, and high. An example of low-level automation is a machine working automatically such as a numerically-controlled machine. (See Fig. 16.6)

An example of medium-level automation is a number of machines grouped together along a production line. (See Fig. 16.7) Each machine is operated by numerical control and connected to the other machine by a transfer machine. The transfer machine automatically positions the part for the next operation.

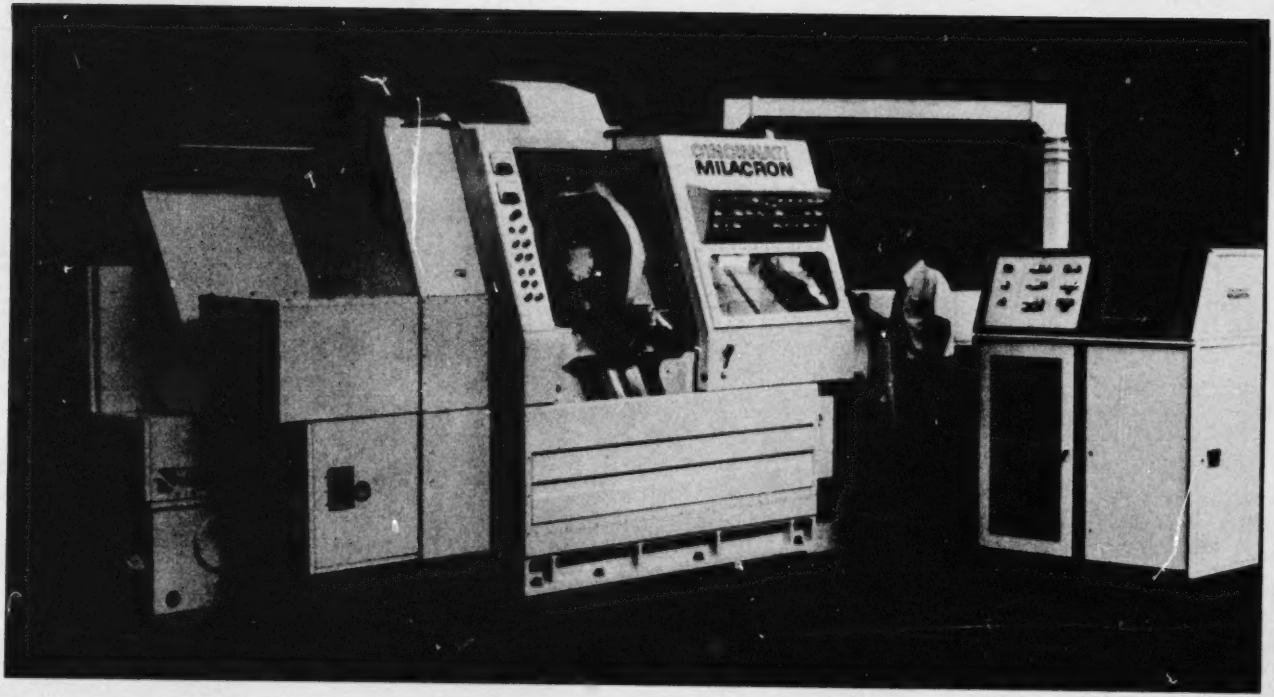


Fig. 16.6. A new Cinturn numerically controlled chucking center. This machine requires a skilled operator. Instructions for machining various products are prepared on punched tape by a programmer. The operator puts the tape in the Acramatic CNC control, and the machine and control complete the part.

(Photo courtesy of Cincinnati Milacron.)

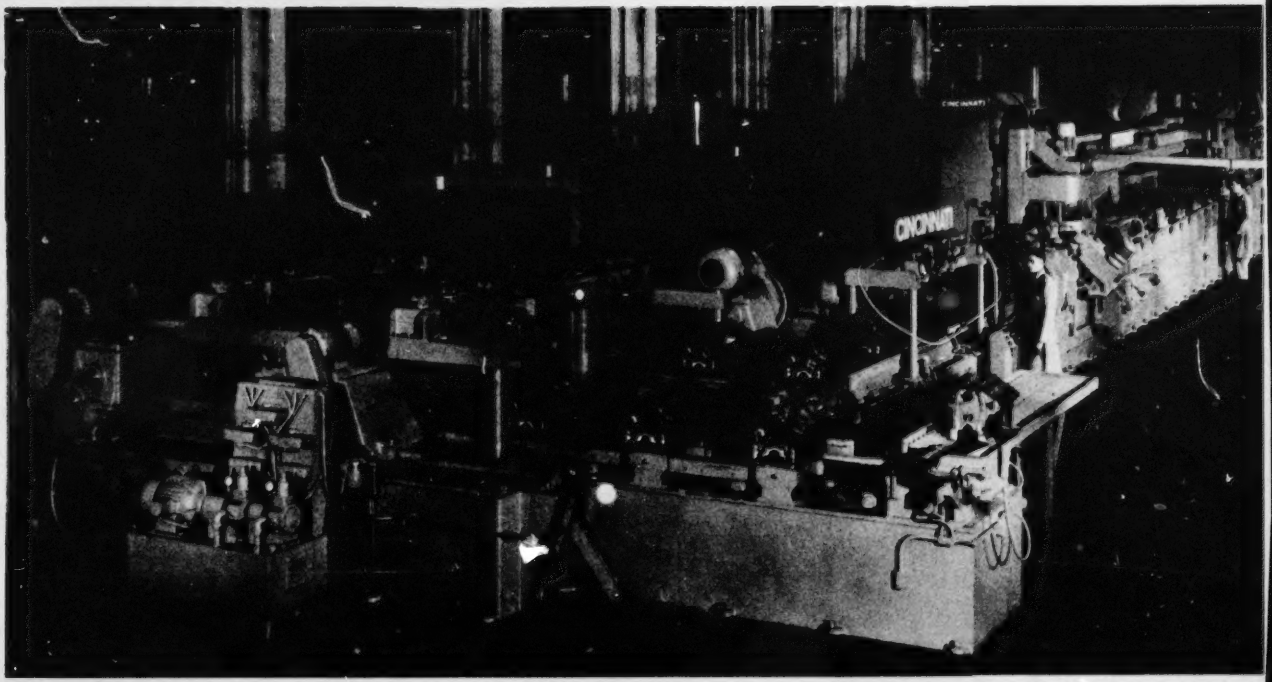


Fig. 16.7. A 36-station transfer line performing broaching, milling, and drilling operations on V-6 and V-12 engine blocks. The horizontal broach and transfer machining stations are connected, and a combination mechanical-electrical transfer bar mechanism positions the blocks for each operation. One operator starts and stops the operations, and another loads and unloads the parts.

(Photo courtesy of Cincinnati Milacron.)

An example of high-level automation is a fully automated and computerized steel mill, or a computer-controlled petroleum refinery. In a fully automated plant, the computer coordinates all plant operations and all levels of automation. Within the computer are stored instructions which tell the computer how to correct deviations.

CAN COMPUTERS REPLACE THE HUMAN BRAIN?

While the first industrial revolution substituted machinery on a vast scale for human and animal muscle, the second substitutes computers for the human brain. A computer is an electronic machine which by means of stored instructions and information can perform complex calculations at tremendous speeds. Computers can perform many intellectual tasks in a few minutes that would take more than a lifetime of human effort. The computer's ability to store and recall masses of detailed information is far ahead of the best performance of human memory. It can store within itself hundreds of thousands of digits and recall any of them in a millionth of a second.[21] Since highly trained brain power is in short supply, computer systems are taking over many mental chores. Just as electric motors and internal combustion engines have made radical changes in the way we use our muscles, computers are changing the way we use our brains.

ARE COMPUTERS INTELLIGENT?

Before answering this question we must arrive at an acceptable definition of intelligence. *Webster's New Twentieth Century Dictionary, Unabridged,* defines intelligence as: (1) the ability to learn and understand from experience, acquire and retain knowledge, (2) the ability to respond successfully to a new situation or to use reason in solving problems or directing conduct effectively, and (3) in psychology, measured success in using these abilities to perform certain tasks. In his book, *Computers and the Human Mind,* Donald Fink shows that a computer can do all these things. It can solve problems. It can learn. It can respond to a new situation if programmed with sufficient sophistication. It can direct conduct as in oil refineries and space explorations—all astronauts are guided in the first critical miles of take-off by computers that observe and correct

the trajectory of the space vehicle. A computer can even answer certain questions from standard intelligence tests.

Donald Fink gives four examples of intelligent machines or computers: (1) A machine that proves mathematical theories, (2) A machine that answers questions, (3) A machine that translates Russian to English, and (4) A machine that plays a game. How can a computer perform tasks which require intelligent behavior like answering different questions, translating one language to another, or playing a game of checkers? A computer is a search and match machine. All the information required to perform a given task must be stored within its memory. For example, to have a computer answer baseball questions, the programmers stored within its memory facts taken from the record book of the season in question—what teams played, on what dates, and with what scores. Then they arranged for the computer to accept, through punched cards, plain-English questions that could be answered by looking up these records. Likewise, to have a computer translate Russian to English, the programmers stored within its memory an "electronic dictionary" containing more than 100,000 Russian phrases, words, and parts of words together with their English equivalents. The computer compares the machine code from its input typewriter with the stored codes in its dictionary. When it finds a match, it types out equivalent English.

The above explanations are oversimplified. The student who wants a more detailed explanation of how the so-called intelligent machines were programmed can read the book, *Computers and the Human Mind*. In so doing, he can explore computer technology as a possible career. The reading should be supplemented by several visits to the computer room in the school, or to the computer room in the industrial community if a computer is not available in school. The student should also talk with people involved in computer work.

SUMMARY

A common example of automation is the use of machines such as robots to perform assembly line operations which were once done by workers. The three levels of automation are low, medium, and high. A numerically-controlled machine is an example of low-level

automation; a group of numerical machines connected together by transfer machines on a production line represent the medium level; and a fully automated plant where all operations are controlled by the computer represents the high level of automation.

A computer is an electronic machine which can perform complex calculations at tremendous speeds by means of stored instructions and information. Computers can prove mathematical theories, answer questions, translate one language to another, or play a game of chess. All the information required to perform these tasks must be stored within the computer's memory. Thus, the computer is a search and match machine. It will search its memory for the correct information to match the question asked or the problem to be solved.

REVIEW

1. List the three levels of automation and give one or two examples of each level.
2. Explain the functions of a computer in a fully automated plant.
3. Name three or more intellectual tasks performed by a computer.
4. List two or more occupations which would be open to a machine operator who is replaced by a numerically controlled machine.

Unit 17 Predictions for Tomorrow

OBJECTIVES

After completing this unit, you should know why future occupations will require higher levels of related knowledge and general education and be able to:

1. Explain why many job dislocations will occur as automation is extended to more industries.
2. Describe the type of jobs that machines are gradually taking over.
3. Point out why jobs are becoming more complex in spite of work simplification and specialization.
4. Explain why a person with more training and education can usually learn a new job faster than a student with less training and education.

FUTURE OCCUPATIONS

What can be predicted about the technology of the future? How can these predictions be used to advantage by students in selecting a career? Most authorities agree that machines are gradually taking over most of the unskilled and low-skilled jobs. As occupations become more complex, higher levels of related knowledge and general education will be needed. The high school diploma required by most employers today will soon be replaced by the junior college diploma.

Automation will be extended to more industries, and automated machines will take over many jobs. As a result of automation, many job dislocations will occur, and retraining will be required. Most authorities agree that the average subprofessional person must look forward to several occupational changes during his or her lifetime. The ease with which you can learn a new job depends on the amount of training and education you have. The more previous training and education you have, the easier it is for you to learn a new job for two reasons: (1) because you have a broader background of knowledge and experience with which you can associate the new learning, and (2) because you have learned how to learn in your previous studies.

WIDER USE OF COMPUTERS

Computers will be used more extensively. More and more plants will become fully automated and computer controlled. Consequently, fewer people will be needed to run these plants. Full employment, with a job available for every person who is willing and able to work, will not be achieved until the workweek is shortened. In an article entitled "Higher Education and Cybernation" which appeared in the *NEA Journal* of March, 1966, David Sarnoff, then Chairman of the Board of RCA, made the following prediction: "Science and technology and the progressive refinement of automation will, in the next twenty years, justify the reduction of the workday to four or five hours."

CHARACTER OF LABOR FORCE WILL CHANGE

As automation is expanded, the character of the labor force in industrial societies will change. The proportion of unskilled labor will decrease to a negligible percentage, as machines like the tomato harvester, Fig. 12.1, are invented and put to use. Semiskilled labor will also decrease as numerically controlled machines take over most of the machine operator's jobs. On the other hand, jobs for highly skilled workers, professional people, and paraprofessionals will continue to rise steadily. (A paraprofessional is an aid trained to assist a professional person.)

As time goes on, one can visualize factories under the regulation of central computing machines which govern the activities of all plant components. The computers will receive feedback information from the various controls, process the information, compute the most satisfactory corrective measures, and issue instructions to the controls they regulate. Thus, even the supervisor of the automatically controlled operating system may be eliminated. The central computers will take over the entire operation and issue reports of the day's performances, including accounting records.

CHALLENGE TO MAN'S FUTURE

In his book, *The Challenge to Man's Future*, Harrison Brown states that with the use of computers, the economic course of the

nation may be plotted with far greater accuracy than was possible in the past. Computers are able to weigh thousands of complicated factors and reach conclusions which will make it possible to avoid economic recessions and depressions. Thus, technology can be used to man's advantage. By avoiding economic setbacks through long range planning with the aid of computers, by revising tax laws so as to place greater burdens upon those who are better able to pay, by making a job available to all people who are willing and able to work, and by making health care available to everyone; a good start can be made in improving the lives of many Americans.

Many economists agree that depressions are caused by the accumulation of wealth in the hands of a few. When millions of Americans have no money to spend, they cannot purchase houses, automobiles, electrical appliances, or clothing. Hence, manufactured goods remain in warehouses, and new houses remain unsold. Increased inventories of manufactured goods cause factory workers to be laid off. Unsold new houses cause construction workers to be laid off. In this way a vicious cycle of unemployment, recession, and depression begins. Some companies have tried to prevent economic slumps by sharing profits with their employees through profit-sharing plans. Such plans have a stabilizing influence on our economy by keeping money in circulation and goods flowing from supplier to customer. They also tend to raise employee morale and improve relationships between employers and employees. Despite the many benefits, companies having profit-sharing plans are few.

Manufacturing engineers are making jobs easier through work simplification, but occupations are becoming more complex because the easier jobs are taken over by machines. These machines are designed by engineers who are responsible for methods improvement. Thus, semiskilled and low skilled jobs are gradually disappearing as specialized machines and robots replace assembly-line workers and numerically operated machines replace machine operators. The only occupations which are increasing are the highly skilled and professional ones which cannot be replaced by machines or robots.

SUMMARY

The average subprofessional person can look forward to several occupational changes during his or her lifetime. As job dislocations occur, retraining of workers will be required. People with more education will learn the new jobs quicker because they know how to study and how to acquire new knowledge better than the poorly educated people. Furthermore, people with more training and education have a broader accumulation of knowledge from which they can draw.

REVIEW

1. Explain why many job dislocations will occur as automation is extended to more industries.
2. Describe the type of jobs that machines are gradually taking over.
3. Explain why jobs are becoming more complex in spite of work simplification and specialization.
4. Explain why a person with more training and education can usually learn a new job faster than a person with less training and education.

SECTION V

Getting a Job and Holding It

Unit 18 How To Prepare a Resumé

OBJECTIVES

After completing this unit, you should be able to prepare a resumé. You will demonstrate this ability by:

1. Defining the word resumé.
2. Explaining what a resumé should summarize.
3. Preparing a resumé which may be sent to a prospective employer.

If you have given serious consideration to the information presented in this manual you should have made a tentative career choice by the time you graduate from high school. Your choice should be based on demonstrated ability, interest, and the required personality characteristics. The career of your choice may involve further schooling or on-the-job training. If you are seeking employment you must learn how to write a good resumé, for only a superior resumé will gain you an interview with the personnel man or the employer. Bear in mind that if a job is worthwhile getting, there will be many applicants.

Resumé is a French word meaning summary, and that's what a resumé is—a brief summary of your experience.[23] It includes your personal history: age, educational background, work experience, and hobbies. A resumé is an indispensible tool, because it helps you to sell yourself to the employer. It provides a focal point for the employer and the applicant.

A resumé should be neat and without messy erasures or misspelled words. It must be typed; never send a carbon copy. A resumé should summarize your qualifications for a job. Sentences should be short and to the point. It should focus attention on your strong points and develop them in regards to the position sought. To have a good resumé you must select the appropriate information

from your background and slant it to the employer's need. A resumé should include the following information:

1. Your name, address, and telephone number.

2. Job Objective: State what you want to do as concisely as possible; for example, Machinist Apprentice.

3. Employment record: List employment in reverse chronological order giving your last or present job first. Give starting and leaving dates, exact name and address of company, and your job title. Include summer jobs, after school jobs, and military experience if any.

4. Education: List name and address of schools attended—secondary or technical schools, and college if applicable. Chronological order should be reversed the same as in item three above.

5. Personal data including birth date, physical characteristics, marital status, and hobbies.

6. References: There are two acceptable ways to handle this item:
   a. List three references, names and addresses of people who know you well. Be sure to obtain permission before using someone's name.
   b. State "References Available" at the bottom of the last page. (In this case you don't supply references.)

SUMMARY

A good resumé is brief, concise, neat and well laid out. It summarizes your qualifications. It focuses on your strong points and develops them in regards to the position sought. A resumé must be typed. Only the original copy or a duplicate is sent to an employer—never a carbon copy.

REVIEW

1. Define the word resumé.
2. Explain what a resumé should summarize and focus attention on.
3. Prepare a resumé which may be sent to a prospective employer. Use the same format as shown on sample resumé on the next page.

Resume of:
JOHN DOE

1011 South Street, Philadelphia, Pa.
PHONE: HOward 6-3210

JOB OBJECTIVE

Machinist Apprentice

EMPLOYMENT

1978-Present
JOHN'S GULF STATION
8200 Ogontz Ave., Phila., Pa.
Service Station Attendant

1977-Summer
ACME SCREW COMPANY
1014 Oak Road, Abington, Pa.
Turret Lathe Operator

1975-1977
After School
FRED'S AUTO REPAIR
143 Street Road, Warminster, Pa.
Mechanic's Helper

EDUCATION

High School:
Abington High School, Abington, Pa.
Graduated 1978

Vocational-Tec School
Eastern Montgomery Vocational Technical School
Upper Moreland, Pa.
Machine Shop Course — Diploma (2 years)

PERSONAL

Born: 4/20/60 in Philadelphia, Pa. Marital status: single
Appearance: Dark brown hair; height: 5'9"; weight: 150 lbs.
Health: Excellent; no physical limitations
Residence: Living with parents
Hobbies: Tennis; archery; metal sculpturing.

REFERENCES

Present employer may be contacted or
Abington High School Guidance Department or
My former shop teacher, Mr. X.

Unit 19 How To Get a Job

OBJECTIVES

After completing this unit, you should be able to:

1. Describe six methods of obtaining a job.
2. Describe how to prepare for a job interview.
3. Write a letter of application in answer to a want ad.
4. Explain how to obtain a social security card.

PREPARATIONS FOR VOCATIONAL TRAINING

After selecting a career, you must make preparations for the training required to achieve your vocational goal. If you have selected a professional career, you will attend an institution of higher learning such as a college or university. If you have chosen a technical occupation, you will attend a post-secondary technical school or community college. But if your career involves work in the manufacturing or construction industries, you will be seeking employment upon graduating from high school. You will be trained on the job and will be earning while learning. You will face keen competition; therefore, you must make careful plans to obtain employment. Some suggestions for these plans are given below. You should:

1. Review your personal characteristics and the characteristics of your chosen career to be sure that a correlation exists.

2. Since your past experiences are probably limited to school activities, plant visits, summer jobs and hobbies; you should know them well so you can speak intelligently about them.

3. Learn to answer want ads (see sample letter of application at the end of this unit), and learn to fill out application forms neatly and accurately.

4. Develop contacts which may lead to a job interview through people who know you well (counselors, teachers, friends, or relatives).

5. Obtain a social security card and working papers if you are less than 18 years old. The working papers can be obtained from your school, but the social security card must be obtained from a Social Security Office. It takes about eight weeks to process an application for a social security card; therefore, you should obtain, fill out and file an application with the nearest Social Security Office well ahead of time.

6. Carry copies of your resumé with you when applying for a job, and leave one with your application.

7. Prepare for a job interview by:
   a. Learning something about the company before the interview. You will be more at ease if you do.
   b. Ask questions concerning salary, hours, company policy, and opportunities for advancement.
   c. Make a good impression: Get a good night's sleep so as to be alert; dress appropriately, be well groomed; avoid being overeager or nonchalant.

SIX ROADS TO A JOB

1. Employment Agencies
   a. State Employment Services—no fee charged.
      State Employment Services are affiliated with the U.S. Employment Service and constitute a Federal-State partnership. Local offices are strategically located in cities and towns in every State. There are over 2400 Public Employment Services throughout the United States.[24]

      Four basic services are provided by the public Employment Service: (1) job information, (2) employment counseling, (3) referral for job training, and (4) job placement.

   b. Private Employment Agencies—fee charged
      Private agencies are an excellent source of occupational opportunities in local areas. These agencies employ counselors to assist clients with career planning and placement. Private agencies charge a fee for their services which may vary from six to ten percent of the first year's

earnings. Since the continued existence of these agencies depends on their ability to find jobs for their clients, they try very hard and usually succeed in placing the people who register with them.

2. Help Wanted Columns of Newspapers.

   a. Most of the jobs listed in want ad columns of newspapers require a written reply. Regardless of how well you are qualified for the job, you have to sell yourself to the prospective employer through a letter of application and a resumé.

   b. The letter should be brief and to the point; it should be typed. Use simple, direct language. Be sure to refer to the resumé, which must be enclosed, but don't cover the same ground as the resumé. Tell about the contribution you can make to the employer. The first twenty words should attract the reader's interest (see sample letter of application at the end of this unit.)

3. Civil Service Applications

   a. Applications and announcements for civil service jobs with the Federal Government may be obtained at any post office. Announcements, which are displayed on bulletin boards, give complete information about the job including job description, qualifications, where to apply, date of examination and sample questions.

   b. Applications and announcements for civil service jobs with the State Government may be obtained from any of the offices of the State Civil Services Commission. In Pennsylvania, there are three offices located in Philadelphia, Harrisburg, and Pittsburgh.

   c. Applications and announcements for civil service jobs with any city government may be obtained from City Hall.

4. Direct Application in Person

   a. If you want to learn a trade through a formal apprenticeship program, contact the nearest office of the Bureau of Apprenticeship and Training for a personal interview. After speaking with a Representative of the U.S. Department of Labor at the Bureau Office, you will be more knowledgeable about formal apprenticeship programs. You will also get leads to various companies in your area who have such programs.

   b. Look through the yellow pages of the telephone book for names of companies engaged in the kind of work you want to do. For example, if you want to be a machinist, look under machine shops; if you want to be a carpenter, look under carpenters or contractors.

   c. Always call for an appointment before visiting a prospective employer or the personnel office of a particular firm. Also leave a copy of your resumé with your application form.

5. Personal Contacts

   a. Develop as many personal contacts as possible through friends, relatives, guidance counselors, and teachers.

   b. It's easier to get a job with a firm if you know someone who works in that company or if you're recommended by somebody who is a friend of the employer or personnel manager.

6. Armed Forces

   a. Many opportunities for vocational training can be found in the programs offered by the various branches of the U.S. armed forces. However, before committing yourself to a particular branch of the service, you should carefully examine what each one has to offer. Since the repeal of the draft law, recruiters have tried to make enlistment very appealing to the volunteer. By asking each recruiting

officer direct questions about opportunities to learn the occupation of your choice, living conditions, and personal restrictions, you will avoid making the wrong selection. Furthermore, you should speak to enlisted men or people who have recently left the service about all phases of life in the armed forces before making a final decision.

b. The various branches of the armed forces are: Air Force, Army, Coast Guard, Marine Corps, and Navy. Jobs open to the enlisted man are based on his aptitudes and the needs of the Army, Navy or the particular branch of his choice.

SUMMARY

Getting a job upon graduating from high school will be much easier if you learn how to plan for employment. Planning means developing contacts which may lead to a job interview, learning how to write a letter of application, answering want ads, and learning how to prepare for a job interview. Planning for employment is especially important if you are not going to college, because you will be seeking a permanent job — one which will provide the opportunity for training in the occupation you have chosen.

REVIEW

1. Describe six methods of obtaining a job.
2. Describe how to prepare for a job interview.
3. Write a letter of application in answer to a want ad (see sample letter on the following page).
4. Explain how to obtain a social security card.

SAMPLE LETTER RESPONDING TO A NEWSPAPER WANT AD

920 Rose Street
Madison, Penna.
September 10, 1978

Oak Machine Company
1076 Rube Road
Madison, Penna.

Gentlemen:

As the enclosed resumé shows, I have had some experience in machine shop work, even though my background is limited. In addition to the two summer jobs, please consider the two-year course in machine shop practice which I completed at the Eastern Montgomery Vocational Technical School. The experience which I gained there in setting up and running machines will enable me to do productive work while completing my apprenticeship.

I hope you will read the resumé and grant me an interview at your earliest convenience. For you can see and understand my enthusiasm for machine shop work only through a personal interview.

Yours truly,
(Signed:)
John Doe

FILMS FOR EXPLORING CAREERS

ALPHABETICAL LISTING: Grade level follows title as "j" for jr. high, "s" for sr. high and "c" for college; film source follows grade level in capital letters; year of publication is the number at the extreme right.

APPLYING FOR A JOB (js) SF — 11 min color **70**
Depicts humorously the things young people say and do during a job interview which impair their chances of getting a job. Correct ways to apply for jobs are also shown.

AUTOMATION — WHAT IT IS AND WHAT IT DOES
(jsc) CORF — 13 min color **66**
Explores the meaning and levels of automation such as: level 1 — an electric can-opener, level 2 — transfer machines, level 3 — the sophisticated feedback of a fully automated petroleum refinery.

AUTOMOBILE ENGINE (js) FORD — 20 min color **60**
Illustrates the various parts of an automobile engine and how they work together. It uses animation and diagrams.

BUILDERS, THE (js) CAB FILM LAB — 30 min color **73**
Four trades associated with the building industry — carpentry, masonry, electricity, and plumbing — are introduced and discussed.

CAREERS IN THE BUILDING TRADES (js) CORF — 11 min color **58**
A student works on a construction job during the summer and observes the following tradesmen at work: plumber, bricklayer, electrician, painter, and glazer.

CHOOSING A JOB (js) EBEC — 12 min color **71**
Shows how career education programs may prevent the frustration of hopping from one job to another after student graduates.

COMPUTER REVOLUTION (ijs) BFA — 24 min color **68**
Discusses practical application of computers in industrial plants, and points out the computer's effect on our world.

DISCOVERING CREATIVE PATTERN (js) BFA — 17 min color **65**
Introduces pattern as a visual organization and illustrates designing from nature.

DISCOVERING TEXTURE (js) BFA — 17 min color 61
Shows how we learn about textures by touching and looking, and how we use paints, tools, and materials to change the texture of surfaces.

DRAFTING-DRAWING AND PLANNING (js) SF — 13 min color 67
Illustrates general lines, dimensions, symbols, and drawing tools.

DRAFTING METHODS (js) SF — 12 min color 69
Introduces alphabet of lines and shows how to draw lines for visible objects, hidden objects, dimension, border, and center lines. Illustrates shop sketches.

DRAMA OF METAL FORMING (js) SHELL OIL CO — 28 min color
Illustrates the many ways of shaping metals by processes not involving machining such as hot forging of massive rotors to drawing of wire.

ENGINES AND HOW THEY WORK (js) CORF — 11 min b/w 58
Using cutaway models, animation, and live action photography, this film explains the operating principles of reciprocating, rotary, and reaction type engines.

IS A CAREER AS A TECHNICIAN FOR YOU?
(js) COUNSELOR — 14 min color 70
Examines the nature of the work technicians do. Discusses where jobs may be obtained, employment outlook, required education and training, opportunities for advancement, and relevant aptitudes and temperament.

IS A CAREER IN ELECTRONICS MANUFG. FOR YOU?
(js) COUN. 15 min color 72
Presents the various tasks involved and other aspects of the job.

IS A CAREER IN GOVERNMENT FOR YOU?
(js) COUNSELOR — 15 min color 72
Presents the various aspects and opportunities for careers in government.

IS A CAREER IN MACHINING FOR YOU?
(js) COUNSELOR — 15 min color 71
Describes various occupations in which men and women work on metal in producing machines and instruments.

IS A CAREER IN RADIO OR TELEVISION FOR YOU?
(js) COUNSELOR — 15 min color 72
Describes the many occupations involving broadcasting—engineering, sales, business, and programming of radio and television stations.

IS A CAREER IN THE SERVICE INDUSTRIES FOR YOU?
(js) COUNSELOR — 15 min color 72
Describes careers in the service industries and encourages young people to seek further information before planning their careers.

IS A SALES CAREER FOR YOU? (js) COUNSELOR — 15 min color 71
Film looks at all kinds of sales careers from selling apples to selling hotels and insurance.

JOINTER (js) DCA — 14 min color 69
Shows sizes, types and operating controls of the jointer. Also shows various operations in detail.

METALS AND MACHINES (js) CAP FILM LAB — 30 min color 73
Introduces the world of metals and machinery, and surveys the five occupations in which training is offered at vocational-tech schools.

PERSONALITY (s) CRM — 30 min color 71
Examines the multiple roles of human personality and the different ways of assessing personality.

RINGS ON MY FINGERS (s) OXFORD — 12 min color 72
Shows how jewelry design combines the trend toward creativity and originality with the art of sculpture.

SO YOU WANT TO BE A TOOL AND DIE MAKER?
(js) NEW — 11 min color 68
Describes the requirements of the apprenticeship program for tool and die maker; reveals income and opportunities for advancement.

STOP THEM BEFORE THEY START (js) EATNA — 14 min b/w
Fire sources such as gasoline vapors, overloaded electric circuits, defective extension cords, spontaneous combustion, and untreated Christmas decorations are shown.

WE'LL SEE TOMORROW (js) JOU — 10 min color 72
Shows shop hazards that can cause serious eye injury. Demonstrates the eye safety devices that can prevent these injuries. Closes with tragedy of blindness which might have been prevented.

PHOTOGRAPHY IN THE USAF (js) NF — 18 min color 63
Illustrates the Air Force's cameramen whose coverage of supersonic air flight operations provides material for history, training films, and news releases.

PRODUCTIVITY—KEY TO AMERICA'S ECONOMIC GROWTH (s) SUEF— 28 min color 66
Introduces student to the American Economic System. Explains relationship between productivity and wages, and between productivity and standard of living.

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